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ENVIRONMENT IMPACT STATEMENT

for

Ili-Wawas Integrated Rural Development Project,
Pomio District, East New Britain Province.

Wide Bay Investments Limited
c/- Tzen Niugini Limited

October 2005

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ACRONYMS

DEC	Department of Environment and Conservation
DoW	Department of Works
EIR	Environment Inception Report
EIS	Environment Impact Statement
EP	Environment Permit
FFB	Fresh Fruit Bunches
LLG	Local Level Government
OPRA	Oil Palm Producers Association
TA	Timber Authority
VOP	Village Oil Palm

GLOSSARY

Agriculture TA means the project area that will be leased under a Timber Authority for Agriculture Clearance and developed into oil palm plantations after merchantable logs have been selectively logged.

Developer means Tzen Niugini Limited, a PNG registered Company *(IPA Registration Certificate No. 91163)* and a Forest Industry Participant *(Forest Industry Participant No. FI01618)* who was nominated by Wide Bay Investments Limited as the Developer of the Ili-Wawas Integrated Rural Development Project.

Fresh Fruit Bunches means the part of the oil palm plant that is processed to extract crude palm oil.

Wide Bay Investments Limited means the Proponent and Landowner Company that is made up of representatives of resource owners from the Ili-Wawas Integrated Rural Development Project area of Pomio District.

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Executive Summary

Executive Summary provides a simple description of the nature of the project, the potential environment and socio-economic impacts and their management strategy. Project benefits to resource owners, Sinivit and East Pomio Local Level Governments (LLG), Pomio District, East New Britain and Papua New Guinea are also outlined. The executive summary is written in **English** and **Tok Pisin** to enable stakeholders to participate in discussion on the impact statement.

ENGLISH

Project Objectives & Description

Ili-Wawas Integrated Rural Development Project is an integrated agro-forestry project that will be established within the Sinivit and East Pomio Local Level Government areas in Pomio District of East New Britain Province.

The project is an initiative of Hon. Paul Tinstein, Minister for Trade and Industry and Member for Pomio Open, with backing of the resource owners, Sinivit and East Pomio Local Level Governments and the Provincial and National Governments. Wide Bay Investments Limited (Proponent and Landowner Company) was incorporated to drive the project. The Landowner Company has representation from four (4) main tribes (Baining, Mengen, Sulka and Tomoip) which represents twelve (12) landowner groups from Sinivit and East Pomio forest area.

The project will take place in two phases –

(a) *Phase (1):* Construction of approximately 135km road that will connect the existing road at Cape Orford TRP (south-west Pomio) to Kokopo Ili (east Pomio) under a Timber Authority for Large Scale Roadline, and

(b) *Phase (2):* Land Clearance for development of oil palm plantations under a Timber Authority for Agricultural Clearance.

The primary objective of the initiative by Wide Bay Investments Limited is to bring development into Pomio District through the agro-forestry project and the construction of the road network to connect Pomio with Kokopo and Rabaul.

The road infrastructure will act as the catalyst for agricultural activities to flourish within the Sinivit and Pomio LLG areas and Pomio District. The integrated agro-forestry project will enable a road network to be constructed followed by establishment of oil palm plantations between Ili (Sinivit LLG) to Wawas villages (East Pomio LLG).

A nuclear oil palm plantation will be initially established at Mevlo valley since the site is currently under State lease and has an existing oil palm estate.

With a new road infrastructure in place, it is envisage that other cash crops such as vanilla, coffee, copra, cocoa and possibly spices would thrive within the Sinivit and East Pomio LLG and Pomio District as a whole because of market accessibility. Other business enterprises would also emerge to take advantage of the road network.

Due to the complementary nature of this agro-forestry project in driving Government's policies and its impact on development within the Pomio District, the Cabinet has issued an "approval-in-principle" in 2004.

The agro-forestry project will also bring to fruition the East New Britain provincial road works program by linking Pomio District with Kokopo and the port of Rabaul. Improvement in the social services within Pomio District will improve due to the road infrastructure and the revenue generated from logging and oil palm activity, in the long term. This outcome is not currently possible due to limited money given to East New Britain Provincial Government under the National Government budgetary process.

The cost of funding the 135 km road from Cape Orford TRP (south-west) to Kokopo Ili (east) under a Timber Authority for Large Scale Roadline is very high and uneconomical due to low density of productive forest within the proposed 40 meter corridor. Current resource data indicated that only 38.7 km out of 135 km has productive forests. This is equivalent to an estimated total volume of 3,250m^3 of logs, which is not economical to sustain the high operating costs of constructing the road infrastructure including bridges and culverts.

In order for the integrated agro-forestry proposal to be economically viable, Wide Bay Investments Limited is also applying for a Timber Authority for Agricultural Clearance. This means that logs would be extracted through selective logging prior to land clearance of selected sites within the project area for establishing oil palm plantations (large plantations and village-oil-palm blocks). Revenue from log exports set aside under the infrastructure fund (K2.00/m^3) will be used to fund the completion of the 135 km road.

It is envisaged that land clearance for oil palm plantation would only occur at locations starting at 5 km to a distance of 10 km inland from the shoreline under a Timber Authority for Agricultural Clearance. The reason for this is that land areas at distances less than 5 km are not suitable for oil palm planting due to high salinity content of the soil.

Land would be cleared for oil palm after it has been selectively logged. Pockets of areas identified as having environmental significance (environmental constraints, buffer zones, etc.) would be preserved in accordance with PNG Logging Code of Practice and the Government's environment policies.

Selective logging under the Timber Authority for Agricultural Clearance may take up to twenty (20) years. Development of oil palm plantations and enrichment plantings of local commercial species would occur within logged-over areas after trees of economical value have been logged.

This approach is the only viable option available to Wide Bay Investments Limited in luring potential investors to invest in the project. The Landowner Company has successfully entered into an agreement with Tzen Niugini Limited (Developer) to finance and develop the proposed Ili-Wawas Integrated Rural Development Project.

Bio-Physical & Socio-Economic Impacts and Management

Ili-Wawas Integrated Rural Development Project will influence the lives of the resource owners and others within Pomio District as a result of the socio-economic changes the development will bring. The socio-economic effects of the project on Sinivit and East Pomio LLGs and Pomio District as a whole will be determined by the manner in which the people embrace the project and the benefit streams from this development activity.

The potential biophysical impacts of the proposed agro-forestry project will be diverse and are connected with the different stages in the development, from road construction and logging operation to establishment of oil palm plantation.

The potential risks of biophysical environmental impacts include –

(a) **water**: water quality degradation due to soil erosion, pesticide and fertilizers runoff and wastewater discharges of sewage effluent and palm oil mill effluent, etc.

(b) **land**: land pollution due to chemical contamination, poor soil quality through excessive application of fertilizers, solid waste disposals, etc.

(c) **air**: impact on air quality due to emission of hydrocarbons from motor vehicles/machinery and generator sets, incineration of combustible materials, emissions from palm oil mill, foul odour from landfills, odour from palm oil mill effluent treatment ponds and sewage treatment ponds, etc.

(d) **noise**: noise pollution would arise from use and servicing of motor vehicles and machinery, generator set, etc.

These issues will be managed through compliance with PNG Logging Code of Practice and environmental policies, guidelines and codes of practices issued by DEC. These standards will be incorporated into the Environment Management and Monitoring Plan and implemented rigorously to manage the environmental risks associated with agro-forestry activity.

PIDGIN

Ili-Wawas Projek em i bai kamap long Sinivit na East Pomio Local Goveman area long Pomio Distrik long East Niu Britan Provins.

Dispela projek em i as tingting bilong Memba bilong Pomio Honorobol Paul Tinstein long bringim developmen igo insait to Sinivit na East Pomio Local Goveman area na tu long Pomio Distrik. Ol papa-graun, Sinivit na East Pomio Local Goveman wantain Provinsal na Nasinal Goveman i suportim dispela agrikalsa na forestri projek.

Wide Bay Investmen Kampani, kampani bilong ol papa-graun i go pas long dispela projek. Dispela kampani i makim fopela (4) haus line em Baining, Mengen, Sulka and Tomoip na twelpela (12) lanoner grup insait long dispela projek area.

Dispela agrikalsa na forestri projek bai stat wantaim wokim bikpela rot (135 kilometa) we bai joinim rot long Cape Orford igo bung waitaim Kokopo Ili aninit long Timba Pemit bilong Wokim Rod we ol Nasinal Forestri Departmen bai givim. Bihain long dispela, bai wok i stat long katim duwai long area we bai Kampani bai i planim oil pam long em. Dispela wok bai kam aninit long Timba Pemit bilong Agrikalsa.

As tingting bilong dispela projek em long bringim devolopmen i kam insait long Pomio Distrik. Dispela rot we bai igo bungim Kokopo na Rabaul bai helipim ol narapela agrikalsa projek olsem kopi an kakau long kamap insait long Distrik bilong wanem bai igat gutpela rot long kisim ol kopi an kakau na ol narapela samting igo long maket long Kokopo na Rabaul. Wok bilong oil pam bai stat wantain pes plantasen we Kampani bai kamapim long Mevlo.

Nasinel Goveman i hamamas tru long dispela wok developmen na i bin givim apruvol bilong em taim ol Kabinet ibin bung long 2004.

Dispela agrikalsa na forestri projek bai i halipim tu East Niu Britan Provinsel Goveman long sait bilong wokim rot insait long provins bikos dispela rot bai joinim Pomio wantaim Kokopo na Rabaul. Dispela wok developmen bai bringim tu sosol sevis ikam insait long Pomio District bilong wanem ol man-meri bai igat sans long painim wok or kisim royati mani long graun na bush bilong ol taim Kampani katim duai na planim oil pam long graun we Kampani i kisim aninit long lis.

Dispela wok projek i bai go inap olsem 20 yia. Tasol, sapos oil pam plantasen we Kampani bai planim na we Kampani halipim ol papa-graun long kamapim oil pam plantasen bilong ol yet, em bai makim wok oil pam igo moa long 20 years. Kampani tu igat plan long putim wanpela oil pam mill long Melvo behain long ol i kirapim pinis ol oil pam plantasen.

Kampani i luksave tu olsem dispela wok devolopmen bai brigim tu liklik hevi long sait bilong environmen olsem na em i bai putim ol plan long mekim so olsem ol hevi bai ino bikpela tumas. Nasinel Goveman undanit long Depatmen bilong Enviromen na Konsaveson igat lo bilong lukautim enviromen taim wok devolopmen ikamap. Dispela lo em bai Kampani bai i bihainim na sapos Kampani i brukim dispela lo bilong lukautim environmen em bai Goveman bai iken kotim em.

Sampela hevi long environmen we bai kamap taim wok developmen istat em –

- wara we bai dati liklik,
- ples we kampani bai kutim rabis bilong em bai bakarap liklik, na
- liklik nois na simuk bai kamap taim Kapani kar iwok long ron

Dispela ol hevi bai Kampani i traim bes bilong em long noken mekim kamap bikpela tumas na bai bihainim toktok na lo we Goveman i putim long lukautim enviromen. Kampani tu bai behanim we bilong katim duwai we Forestri na Environmen Depatmen putim insait long Loging Buk.

1. Purpose of the Development

1.1 INTRODUCTION

This Environmental Impact Statement (EIS) documents all potential environment and socio-economic issues that are likely to arise as a result of the proposed Ili-Wawas agro-forestry project. The management measures for each of these issues are also outlined. These commitments by the Developer will ensure that an appropriate management regime is put in place in order to avoid and minimize the negative impacts of the project.

1.2 PURPOSE OF DEVELOPMENT

The primary objective of the development project proposed by Wide Bay Investments Limited is to bring socio-economic development into Pomio District, especially the Sinivit and East Pomio Local Level Government areas (LLGs). This objective will be achieved through implementation of the agro-forestry project and the establishment of the road network to connect Pomio with Kokopo and Rabaul.

Through this impact project, the development goals of Pomio District under the District Development Plan will be realized. The economic growth within the district will directly contribute towards attainment of the broader Provincial and National Government Development Strategies.

The specific objectives that will be achieved through this development project are –

1. **Improvement in social services.**
   There will be a general improvement in social services within Sinivit and East Pomio LLGs and Pomio District as a whole, through project assistance to schools, aid posts, etc. by construction of new buildings and/or refurbishment of existing buildings. Water tanks will be provided to villages for supply of clean and safe drinking water. Villages located next to the Base Camps at Tot, Ili and Kiep will benefit from free supply of electricity. People living in Pomio District will benefit from the road network to gain access to markets in Kokopo and Rabaul.

2. **Provision of employment opportunities.**
   Employment will be provided during road construction, logging operation and when establishing the oil palm plantations. It is estimated that around 500 people will be employed in the above activities while an additional 50 people will be engaged when the sawmill becomes operational. Indirect employment as well as self-employment will also be created through spin-off businesses. Employment opportunities created by the project will contribute towards reducing the poverty level within Pomio District.

3. **Generation of revenue.**
   Revenue will be generated initially from the log harvesting. Revenue generated will benefit the resource owners and the LLGs through the establishment of Reforestation Fund, Agricultural Fund, Infrastructure Fund, Business Development Fund and Community Services Fund. Resource owners, through the Landowner Company, will receive Timber Royalties and Premium Payments. Provincial Government will benefit from the Provincial Government Grants while the National Government will receive Log Export Tax.

   In the longer term, owners of customary land in which oil palm plantation is established under the "lease lease-back" arrangement will receive rental fees and royalties while owners of village-oil-palm (VOP) blocks will continue to generate income from sale of fresh fruit bunches (FFBs) to the palm oil mill that will be established during Year 7 of operation. With an agriculture base, long-term revenue source for the resource owners, Pomio District and East New Britain Province looks promising.

4. **Spin-off businesses.**
   Spin-off businesses will also thrive as a result of the agro-forestry project. These additional activities may include fishing, garden food, cash crops, PMV service and so on. Assistance will be provided in establishing the village-oil-palm schemes. Other cash crops such as vanilla, coffee, copra, cocoa and spices will also flourish in the District as a result of the road network.

1.3 FOURTH NATIONAL GOAL AND DIRECTIVE PRINCIPLE

Any development activity undertaken in Papua New Guinea (PNG) has to be carried out in accordance with the Fourth National Goal and Directive Principle of the National Constitution of PNG. This is shown by the ability of the Developer to demonstrate commitment to the conservation of natural ecosystems and protection of environmental values within the proposed project area.

The Fourth National Goal states that –

> ***"We declare our fourth goal to be for Papua New Guinea natural resources and environment to be conserved and used for the collective benefit of us all and to be replenished for the benefit of future generations."***

In recognition of the above guiding principle, the Developer will unreservedly observe the key objectives in the PNG National Constitution and ensure that the agro-forestry project is carried out in a sustainable manner in accordance with the Government's Sustainable Development Policy and National Forest Policy. In addition, natural ecosystems and environmental values that are identified within the project area as being of national, cultural, archaeological or environmental significance will be demarcated and protected.

1.4 CONSISTENCY WITH GOVERNMENT'S DEVELOPMENT STRATEGY

The proposed development will complement the National Government's Export-Driven Economic Recovery Policy, Sustainable Development Policy, National Forest Policy and the "Green Revolution" Strategy, which promotes socio-economic growth through revitalization and expansion in the agriculture sector. The agro-forestry project is aimed at encouraging socio-economic development at the rural area through a sustainable and long-term agricultural activity.

The project will also contribute towards attainment of the Government's Poverty Alleviation Strategy and other related policies under the Medium Term Development Strategy through supporting the Government's effort in providing social services (health, education, etc), direct and indirect employment, income generation and creation of spin-off business activities.

Government's development goals will be complemented within Pomio District through downstream processing and export of merchantable logs extracted from within the road corridor and the project area designated for oil palm development. In accordance with the Forest Policy, enrichment plantings will also be carried out using local commercial tree species. The establishment of an agriculture base through oil palm plantations and village-oil-palm blocks will support sustainable development strategy and green revolution concept through long-term agriculture growth within the District.

The road link will not only present an stimulus for economic growth due to oil palm development in Pomio District but also provide market accessibility to Kokopo and Rabaul and therefore encouraging growth in other agricultural activities such as vanilla, coffee, copra, cocoa and spices.

Due to the complementary nature of this agro-forestry project in driving National Government's policies and development agenda within the Pomio District, the Cabinet has issued an "approval-in-principle" for the project through NEC Decision No. 199/2004 (**Appendix 1**).

The agro-forestry project will also bring to reality the East New Britain Provincial Government's provincial road-works program by linking Pomio District with Kokopo and the port of Rabaul. Improvement in the social services within Pomio District will become apparent as a result of the road infrastructure and the revenue generated from logging and oil palm activity, in the long term. This outcome is not currently possible due to limited annual budgetary allocations given to East New Britain Provincial Government (and subsequently the Sinivit and East Pomio LLGs) and the absence of a road network linking Pomio with Kokopo and Rabaul.

1.5 PROJECT DEVELOPMENT BENEFITS

The agro-forestry project will boost socio-economic growth in Pomio District and East New Britain Province. Development benefits that will be derived from the project include improved social services (health and education), employment benefits, spin-off business and infrastructures like roads and bridges, and water supplies. Free electricity will be provided to Tot, Ili and Kiep villages due to their close proximity to the proposed locality of the Base Camps.

The financial benefits from the logging operation will be immediate compared to the financial returns from the oil palm development activity. Benefits that will be generated during log harvesting from the road corridor and the project area designated for oil palm development are described on the next page.

1.5.1 Projected Revenue

The projected revenue from sale of round logs and sawn timber products are detail below.

(a)	Export Round Log sales	= K586,800,000.00
(b)	Sawn Timber sales	= K 86,400,000.00
	Total	**= K673,200,000.00**

1.5.2 Beneficiaries

Details of the beneficiaries from revenue generated from sale of round logs and sawn timber products are provided below.

Recipients	Amount
(a) Landowners	
Timber Royalties – (K10.00/m³)	= K31,150,000.00
Premium Payments – (K4.00/ m³)	= K11,736,000.00
Sub-Total:	**= K45,820,000.00**
(b) Provincial Government	
Provincial Government Derivation Grant (K0.50 of export vol.)	= K1,467,050.00
Sub-Total:	**= K1,467,050.00**
(c) Production and Administration Cost (Direct cost & Total overheads)	= K368,818,535.00
Sub-Total:	**= K368,818,535.00**
(d) **Development Fund**	= K15,575,000.00
Sub-Total:	**= K15,575,000.00**
(e) National Government	
Log Export Tax (K62.20)	= K182,494,800.00
Corporate/With-holding Tax	= K11,761,208.00
Sub-Total:	**= K194,256,008.00**
(f) Management Fee (K1.50 of export vol.)	= K4,401,000.00
Sub-Total:	**= K4,401,000.00**
(g) Project Net Profit	= K45,796,407.00
Sub-Total:	**= K45,796,407.00**
TOTAL AMOUNT:	**= K673,200,000.00**

2. Viability of the Project

Chapter 2 discusses the viability of the agro-forestry project in terms of forest resource volume, financing and landowner support.

2.1 ECONOMIC FEASIBILITY

The project is economically feasible as an integrated agro-forestry project but not as a stand-alone oil palm project. This is because the cost of constructing the 135 km road (40 m corridor) is substantially high. Since the road construction cost will be borne solely by the Developer, the huge amount of money spent must be recovered from somewhere. Wide Bay Investments Limited has structured the project proposal to make it economically viable for the Developer to invest by promoting the sale of merchantable logs salvaged from the road corridor during road construction and from selective logging within the project area designated for oil palm development. Revenue from sale of logs set aside in the Infrastructure Fund will be used in completing the road infrastructure.

Revenue from oil palm would not be available immediately until about seven (7) years after planting when the palms reach maturity and produce fresh fruit bunches. A palm oil mill will be established at Year 7 of operation (five years after establishment of a nuclear oil palm estate) through a joint venture between the Landowner Company and the Developer to process FFBs into palm oil for export to overseas markets.

Therefore, in order to ensure that there are sufficient funds available to offset the operational costs of the road construction, it is essential that selective logging is conducted concurrently in the project area prior to conversion of selected areas into oil palm plantation and village oil palm schemes.

2.1.1 Forest Resource Volume

Oil Palm Project Area

The project boundary for the oil palm project commences along the coast of Cape Bogan, Simbali, Tomoip, Wide Bay and Kolmal. It starts from south of Merai village on the mouth of Merai River in Sinivit LLG and extends inland from the coast to about fourteen (14) kilometers and runs parallel to the coast to Wawas village which shares the border with Cape Orford TRP in East Pomio LLG. The project area comprises a total land area of approximately 171,000 hectares and is divided into twelve (12) customary zones –

Tribal Groups	Timber Areas
1. Baining	Ili , Karong, Marunga, Simbali
3. Sulka - Mengen Mix	Lamesipun
4. Tomoip	Kokakim, Lote-Kamlang
5. Sulka	Bitelong, Lakae, Kiwaigu
6. Mengen	Tesata, Kaluan
7. State	State Land

The forest area within the oil palm project boundary, which will be secured under the Timber Authority for Agriculture Clearance, is sub-divided into twelve (12) Timber Authorities (TA), as shown below –

Table 1 – Details of Oil Palm Project Area

Timber Authority No.	Timber Authority Name	Area (ha.)
TA – 1.	Ili	10,626
TA – 2.	Karong	22,325
TA – 3.	Marunga	21,253
TA – 4.	Simbali	30,537
TA – 5.	State Land	10,000
TA – 6.	Kermen	22,401
TA – 7.	Lote-Kamlang	23,060
TA – 8.	Lakae	12,257
TA – 9.	Kiwaigu	8,120
TA – 10.	Kokakim	10,421
TA – 11.	Tesata	(aggregate volume)
TA – 12.	Kaluan	
	TOTAL:	**171,000**

NOTE: 171,000 hectares is the gross area earmarked for the agro-forestry project.

Road Corridor

On the other hand, the boundary for the 135 km road with 40 m corridor which runs from Cape Orford TRP (south-west) to Kokopo Ili (east) and connects the twelve (12) TAs, has a total area of 538 hectares as shown in the Table below –

Table 2 – Details of Road Project Area

Description of Different Road Segments	Distance (km)	Width (m)	Area (ha.)
TA – 1: **Ili**	12.7	40	50.8
TA – 2: **Karong**	26.7	40	106.8
TA – 3: **Marunga**	12.0	40	48.0
TA – 4: **Simbali**	13.3	40	53.2
TA – 5: **State Land**	2.1	40	8.4
TA – 6: **Kermen**	19.1	40	76.4
TA – 7: **Lote-Kamlang**	10.7	40	42.8
TA – 8: **Lakae**	9.7	40	38.8
TA – 9: **Kiwaigu**	7.6	40	30.4
TA – 10: **Kokakim**	20.8	40	83.2
TA – 11: **Tesata**	(aggregate distance)	40	(aggregate volume)
TA – 12: **Kaluan**		40	
TOTAL	**134.7**	**40**	**538.8**

Forest Resource Survey

On two occasions, the Developer conducted the forest resource survey of the project area. PNG Forest Authority conducted forest resource survey on the project area in 1989 and 1994 (survey documents), which resulted in a few timber permits being issued for logging operations within the project area as summarized below. However, these logging operations have now ceased.

Timber Areas	Developer	Year Logged
1. Kaluan	Niugini Lumber Co.	2002
2. Lote-Kamlang	Kerewara Ltd	2002
3. Simbali	Open Bay Timber Co.	2000
	Kerewara Ltd	2002
4. Simbali Extension	Open Bay Timber Co.	1990
5. Ili	Kerewara Ltd	Small Operation only 2003

Recent surveys conducted by the Developer and Wide Bay Investments Limited were from 1st – 31st March 2004 and 8th – 15th March 2005. The continuous strip-line method was used during the two surveys.

2.1.1.1 Forest Resource

Oil Palm Project Area

Analysis of the data obtained from the forest resource surveys showed that the proposed oil palm project area to be leased under a Timber Authority for Agriculture Clearance is categorized as lowland rainforest and comprised of two major forest types. They are Small Crowned and Medium Crowned forest types. The total area of coverage in terms of the loggable area is tabulated below.

Table 3 – Details of Net Operable Area (Oil Palm Project Area)

Forest Type	Area Covered (ha.)
Small Crowned - forest type	98,500
Medium Crowned - forest type	60,500
TOTAL:	**150,000**

On the other hand, certain areas within the project area will not be logged due to certain constraints (karst, inundation, cultural sites, etc.) and restricted under the PNG Logging Code of Practice. Other areas are classified as "non-timber areas" since these sites do not have merchantable log species and this also refers to the log-over sites within the project area.

Photo 1.	Lowland rainforest.

The size and description of operable and non-operable logging areas within the proposed oil palm project area is presented in Table 4.

Table 4 – Description of Operable and Non-operable Areas (Oil Palm Project Area)

Description	Area (ha.)
Commercially forested – operable area	150,000
Steep and Rocky – non-operable area	14,025
Non-timber Area – non-operable area	5,975
TOTAL:	**171,000**

The forest resource within the oil palm project area is sub-divided into twelve (12) Timber Authority (TA) areas, as shown in Table 5.

Table 5 – Details of Forest Resource (Oil Palm Project Area)

Timber Authority Description	Gross Area (ha.)	Net Area (ha.)	Volume per Hectare (m^3/ha. – mean/net)	Estimate Volume (m^3)
TA – 1: **Ili**	10,626	9,321	21	195,741
TA – 2: **Karong**	22,325	19,592	21	411,432
TA – 3: **Marunga**	21,253	18,713	21	392,973
TA – 4: **Simbali**	30,537	27,296	21	573,216
TA – 5: **State Land**	10,000	10,000	21	210,000
TA – 6: **Kermen**	22,401	18,490	21	388,290
TA – 7: **Lote-Kamlang**	23,060	20,482	21	430,122
TA – 8: **Lakae**	12,257	10,452	21	219,492
TA – 9: **Kiwaigu**	8,120	7,213	21	151,473
TA – 10: **Kokakim**	10,421	8,441	21	177,261
TA – 11: **Tesata**	(aggregate		21	(aggregate volume)
TA – 12: **Kaluan**	volume)		21	
TOTAL:	**171,000**	**150,000**	**21**	**3,150,000**

NOTE: Gross Volume per Hectare (m^3/ha. – mean/gross) = 28.

A summary of the forest resource volume within the project area that will be extracted and sold as finished timber products or as round logs is tabulated below.

Table 6 – Forest Resource Volume (Oil Palm Project Area)

Description	Quantity
Gross Area	171,000 hectares.
Net Area	150,000 hectares
Average Stand Density	28m^3 per hectares
Gross Volume	4,200,000 m^3
Less 25% allowance for sampling error and defects	1,050,000 m^3
Net Volume	3,150,000 m^3

NOTE: Main species are : Terminelia, Taun, Wau Beech, Dellenia, Red Canarium, Calophyllum, Water Gum, Labula, Walnut, Malas, Rosewood, Pencil Cedar, Planchonella and Amberoi.

The harvesting rate is calculated with consideration of developing a sustainable logging operation for up to 20 years, complemented with enrichment planting of fast-growing local tree species.

Income generated from the sale of finished timber products and round logs in the first five years of operation would be used to establish the oil palm plantations and complete the construction of the 135 km road network.

The summary of the logging schedule and log budget is given in Table 7 and Table 8, below.

Table 7 – Schedule of Log Harvest (Oil Palm Project Area)

Project Year	Proposed Annual Cut	Total Volume (m^3)
PY 1-5	200,000	1,000,000
PY 6-10	180,000	900,000
PY 11-20	125,000	1,250,000
Total	**505,000**	**3,150,000**

NOTE: Allowable Annual Cut (AAC) will be recalculated after establishment of forest plantation of local fast-growing tree species. AAC will be calculated after discussion with PNG Forest Authority and presented in the Five Year Logging Plan and Annual Logging Plan.

Table 8 – Schedule of Log Budget Utilization (Oil Palm Project Area)

Project Year	Export Volume (m^3)	Sawmill Input (m^3)	Total Volume (m^3)
PY 1-5	964,000	36,000	1,000,000
PY 6-10	840,000	60,000	900,000
PY 11-20	1,130,000	120,000	1,250,000
Total	**2,934,000**	**216,000**	**3,150,000**

During the first to third year (PY 1-3) of operation, only round logs will be exported and revenue generated would be used to offset operational expenses, as well as the payment of royalties and taxes. The sawmill will be established at Tol during the third year (PY 3) of operation. Most of the log output in the first three years by portable sawmill will be used in building camp facilities as well as for consumption in the project area.

Road Corridor

The forest resource survey showed that merchantable log within the boundary of the 135 km road corridor is very minimal and not economical to offset the costs associated with the road construction as shown in the Table on the next page.

Table 9 – Details of Forest Resource (Road Corridor)

Description of Different Road Segments	Area (ha.)	Volume per Hectare (m^3/ha.)	Estimate Volume (m^3)
TA – 1: **Ili**	50.8	00.0	0.0
TA – 2: **Karong**	106.8	21.0	2,242.8
TA – 3: **Marunga**	48.0	21.0	1,008.0
TA – 4: **Simbali**	53.2	00.0	0.0
TA – 5: **State Land**	8.4	00.0	0.0
TA – 6: **Kermen**	76.4	00.0	0.0
TA – 7: **Lote-Kamlang**	42.8	00.0	0.0
TA – 8: **Lakae**	38.8	00.0	0.0
TA – 9: **Kiwaigu**	30.4	00.0	0.0
TA – 10: **Kokakim**	83.2	00.0	0.0
TA – 11: **Tesata**	(aggregate volume)	(aggregate distance)	(aggregate volume)
TA – 12: **Kaluan**			0.0
TOTAL	**538.8**	**0.0**	**3,250.8**

Out of the total road length of 135 km, only 38.7 km contained productive forest with a gross volume of 3,250 m^3. This volume is recorded during the resource survey and only occurs between Karong (TA-2) and Marunga (TA-3).

2.1.1.2 Markets

Major oversea markets for the tropical round logs are Malaysia, Taiwan, China, Japan and possibly South Korea. On the other hand, sawn timber products would be sold locally as well as exported to Taiwan, Australia, South Korea and New Zealand. The expected prices for the tropical round logs and finished timber products are summarized below.

1. *Round Logs*
   (a) Annual Export Volume (average) = 148,000 m^3
   (b) FOB Price (average) = K200.00 per m^3

2. *Sawn Timbers*
   - Annual Input Capacity = 12,000 m^3
   - Annual Output (45% recovery) = 5,400 m^3
   - Average Price = K400.00 per m^3

2.2 PROJECT FINANCING

The agro-forestry project will require substantial capital investment. The cost of construction of the 135 km of road network (including bridges and culverts) is substantial and the Developer will fund the initial cost. The estimated capital investment in the logging operation including purchase of logging equipment & machinery, establishment of sawmill, base camp and working capital, etc is approximately K60,000,000.00. The money will be secured by the Developer and injected into the Ili-Wawas agro-forestry project.

Financing for the agro-forestry project will be sourced from Bank Islam Limited of Malaysia (**Appendix 2**).

2.3 TECHNICAL EXPERTISE

The Developer has technical expertise and skills in construction of logging roads in accordance with the PNG Logging Code of Practice, which essentially complies with the Department of Works (DoW) standards for roads and bridges. Prior to commencement of construction work on the 135 km road, the DoW would be consulted to ensure that the 135 km road network (including bridges and culverts) is constructed in accordance with the required standards so that it can be easily converted into national road after certification.

The Developer also has a vast knowledge and experience in logging operation and has current operations at East, West and Central Arowe TRPs in West New Britain Province. These knowledge and skills would be utilized in ensuring that the salvage logging operation within the road corridor as well as selective logging within the oil palm project area is carried out in accordance with the PNG Logging Code of Practice and other conditions impose by DEC.

For development of oil palm plantation and village oil palm blocks, the Developer will engage rural extension officers from East New Britain to assist with establishment of the plantation and conduct rural outreach programs. Skilled oil palm plantation managers will be recruited from Malaysia to oversea the planning and development of the oil palm plantation on selected sites within the project area with the nuclear oil palm estate at Melvo valley.

2.4 RESOURCE OWNER SUPPORT

The project is an initiative of Hon. Paul Tinstein, Minister for Trade and Industry and Member for Pomio Open with endorsement from landowners within the Sinivit and East Pomio areas of Pomio District. The project is being promoted by Wide Bay Investments Limited with representation from twelve (12) land-owing clans within the project area with National Member for Pomio Open being the Chairman.

Sample copies of the Resource Owners consents are attached (**Appendix 3**).

2.5 LIFE-SPAN AND PROJECT DEVELOPMENT PHASES

The Ili-Wawas Integrated Rural Development Project will be developed over a 20 years period. This is the timeframe where the log harvesting of natural forest will ceased while logging operation on plantation forest will commence. On the other hand, the operation of the oil palm plantation and the palm oil mill will extend the life the project beyond the 20 years period. Extensions to the project life will dependent on the renewal of land leases on which the oil palm plantations are established.

Ili-Wawas Integrated Rural Development Project was scheduled to commence in the first quarter of 2005. However, there was a slight delay due to setbacks in obtaining relevant State approvals. Once the approvals are obtained by Widebay Investments Limited, the project will commence operation by first quarter of 2006.

Roads

Roads would be established during Year 1 of operation. Construction work would commence on the 135 km road by connecting the existing road at Cape Orford TRP in south-west Pomio to Kokopo Ili in the east under the Timber Authority for Large Scale Roadline. Logging roads will also be established in the completed sections of the 135 km, in order to enable selective logging to occur concurrently. It is anticipated that the 135 km road network will be completed during the first year of operation but this may also go on until the early part of Year 2 of operation due to unforeseen delays.

Logging

Logging operation will start during Year 1 of operation after the establishment of Base Camps and Wharf & Jetty. Salvage logging will commence with the extraction of merchantable logs from within the 135 km road corridor. Selective logging within the oil palm project area will start once the logging roads are constructed and coups and set-ups have been demarcated and clearance on the Five Year and the Annual Logging Plans are obtained from PNG Forest Authority.

Sawmill and associated timber processing facilities will be established during Year 3 of operation while plantation forest will be set up during Year 10 of operation. Based on the current forest resource data and the annual allowable cut, it is estimated that logging operation will continue for the next 20 years. However, this may change upon verification by PNG Forest Authority.

Oil Palm

The nuclear oil palm estate will be established during Year 3 and Year 4 of operation at Mevlo valley. On the other hand, it is expected that village-oil-palm blocks will be set up soon after the establishment of nuclear estate, during Year 5 of operation and onwards after an oil palm nursery is established at Melvo valley.

3. Description of Proposed Development Activity

The different components of the Ili-Wawas Integrated Rural Development Project are described in Chapter 3. The different components of the project are (1) road construction under the TA for Large Scale Roadline, (2) logging operation under TA for Agriculture Clearance, and (3) establishment of oil palm plantations, village-oil-palm blocks and palm oil mill.

3.1 ROAD

The first phase of the agro-forestry project will be the construction of approximately 135 km road network that will connect the existing road at Cape Orford TRP (south-west) to Kokopo Ili (east) under a Timber Authority for Large Scale Roadline.

3.1.1 Proposal

Work on the 135 km road (40 meters width) will involve upgrading of abandoned roads in rundown state in certain areas of the road alignment whilst new roads will be constructed in areas where there is none in existence. Current forest resource data indicated that only 38.7 km out of 135 km road corridor has productive forests. This is equivalent to an estimated total volume of 3,250m^3 of logs and is not economical to sustain the high operating costs of the road infrastructure including construction of bridges and culverts.

However, the capital invested by the Developer in the construction of the 135 km road can only be recovered from sale of merchantable logs salvage from the road corridor and from selective logging within the oil palm project area prior to conversion of selected sites into oil palm plantation.

The road would be regarded as a logging road during its construction and while the logging operation is in progress. Progressive upgrading of the road (e.g. from log-bridge to fabricated metal bridge) will be carried out by the Developer to meet the Department of Works (Dow) standards. Upon completion, a formal certification will be conducted by DoW before transferring and reclassifying the road as a national road for supervision and maintenance by the National Government.

The road will be constructed using Kom D155A, Kom D70LE, Motor Grader CAT 120G, Compactor, Bucket Loader CAT966, Excavator KOM PC200, Dumptruck NISSAN TZA52 and other appropriate machinery. The planning and design of the 135 km road including bridges and culverts will be undertaken by professional Civil Engineers in accordance with the DoW road design standards (**Appendix 4**).

Logging roads for selective logging within the oil palm project area will be constructed in accordance with the design standards in the PNG Logging Code of Practice.

The activity will begin with the survey of the proposed road alignment in order to obtain relevant engineering data such as the gradient, soil structure, surface water crossings, etc. to establish the best route at minimum cost. However, the construction of the 135 km road and associated infrastructure from Cape Orford TRP (south-west) to Kokopo Ili (east) will be done in accordance with the design standards from the Department of Works.

3.1.2 Location Map

The map of the 135 km road from Cape Orford TRP (south-west) to Kokopo Ili (east) is provided in **Appendix 5**.

3.1.3 Site selection

The proposed route for the 135 km road network is based on the need to connect the existing abandon roads as well as to ensure that the most economical route is followed in areas where there is no road in existence. Preliminary survey of the proposed route indicated that it would be economical as well as environmentally friendly to construct the road through the forested areas indicated due to absence of ecological and biophysical constraints.

3.1.4 Nearby Development Activities

Presently, there are no major development activities adjacent to the proposed road alignment that may contribute additive effects to background pollution levels.

On the other hand, road construction will only have localized effects, which will be further minimized by observing appropriate environmental guidelines. These biophysical impacts will dissipate as the road works move to another location and natural processes of soil stabilization and vegetation growth takes effect.

3.1.5 Associated Infrastructures

Bridges and culverts that are constructed along the 135 km road will comply with the DoW design standards. On the other hand, bridges and culverts for the logging roads within the oil palm project area will be constructed in accordance with the requirements in the PNG Logging Code of Practice.

3.2 LOGGING

The logging phase will commence with salvage logging operation within the 40 meter corridor during construction of the 135 km road from Cape Orford TRP (south-west) to Kokopo Ili (east) under a Timber Authority for Large Scale Roadline. In areas where the road has been established, selective logging operation will commence concurrently under a Timber Authority for Agriculture Clearance.

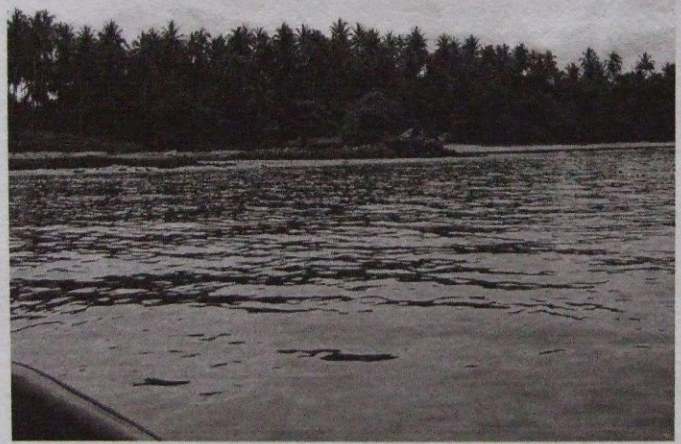
3.2.1 Proposal & Process Technologies

3.2.1.1 Proposal

The logging operation that will be undertaken under the Timber Authorities for Large Scale Roadline and Agriculture Clearance are quite similar and are described below.

Infrastructure

The logging phase will commence with the establishment of Base Camps and Wharf & Jetty. Sites at Lil, Tol and Kiep that are selected for establishment of Base and Logging Camps will be cleared and facilities such as workers accommodation, offices, workshop, fuel storage facility, generator set and other related facilities will be established. Log pond and wharf/jetty, which are vital to the logging operation, will also be constructed.



These infrastructures are vital and necessary to ensure that workers who are engaged in the construction of the 135 km road and the logging operation are adequately housed. The facilities will also ensure that an efficient support service is provided to the road construction activity and the logging operation and eventually the oil palm activity during Year 3 of operation. Sawmill and associated timber processing facilities will also be established during Year 3 of operation.

Photo 2.	Site of proposed Base Camp, wharf and jetty.

Log Harvesting

The actual logging operation is similar to other logging activities currently in operation around the country. The operation begins with a forest survey in order that coups, set-ups and buffer zone boundaries are demarcated. Log landing, snig track layout, tree classification and marking are performed. Logging roads discussed under Section 3.1 are also constructed.

Once these initial preparations are completed and Five Year and Annual Logging Plans are approved, the log harvesting operation is conducted through selective felling of marked merchantable tree species. The branches on the felled trees are removed and transferred to log landings for transport to the log pond.

Log Pond
At log pond, the logs are sorted and graded for export as round logs. Those that do not meet export market specifications are transported to the sawmill for processing into timber products for both export and domestic markets.

3.2.1.2 Process Technologies

Logs earmarked for processing into wood-based products at the sawmill are debarked and cut according to required specifications. The logs are fed into different process machinery in accordance with the buyer's orders. The wood-based products that are produced at the sawmill are sorted out according to specifications and placed in storage for shipment.

A summary of the sawmill processes for production of rough sawn timbers and mouldings are illustrated below.

Figure 1. Process for Production of Rough Sawn Timbers.

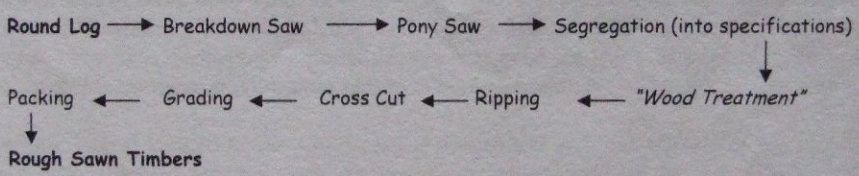
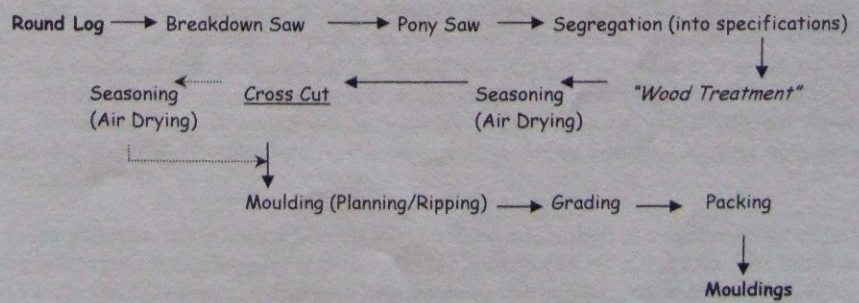


Figure 2. Process for Production of Mouldings.



3.2.2 Location Map

The map of the proposed oil palm project area that will be secured under the Timber Authority for Agriculture Clearance is appended (**Appendix 6**).

3.2.3 Site selection

The oil palm project area was selected by the Wide Bay Investments Limited after a general consensus amongst the twelve (12) landowner groups from Sinivit and East Pomio forest area. Wide Bay Investments Limited (Proponent and Landowner Company) was incorporated to drive the project on behalf of the resource owners.

That decision by the Proponent and Landowner Company was made due to availability of sufficient forest resource volume within the project area to sustain an economically viable agro-forestry project. In addition, the project area also has suitable soil characteristics for growing of oil palms.

3.2.4 Nearby Development Activities

Apart from the existing oil palm plantation under State land at Melvo valley, there are no other major development activities within or adjacent to the proposed oil palm project area that may contribute to the additive background pollution levels. Although, a number of small-holder blocks have been cultivated by villagers into copra, coffee and cocoa blocks, these village plantations are small and not well managed due to difficulty in marketing the cash crops. Therefore, fertilizers or pesticides are not used on the village plantations and chemical runoff from these small-holder blocks is non-existent.

Cape Orford TRP is located to the south-east of the project area but outside of the project boundary. The logging concession is no longer in operation. On the other hand, the proposed Sinivit Gold Mine which is located in the Nakanai Mountain Range to the north-west of the project area is too far to have any influence on background pollution levels.

The existing oil palm plantation at Mevlo valley may become the most significant source of additive effect on background pollution level within the project area. The effects are mainly associated with the risk of chemical pollution of Mevelo River from pesticide and fertilizer runoff. High sediment load may also be deposited into the surface water as a result of soil erosion associated with activities connected to the existing oil palm plantation. Where this happens, the discharges will contribute to increase pollution levels within Mevelo River. These existing water quality impacts may be aggravated during selective logging operation within Simbali (TA-4).

The existing pollution levels within Mevelo River will be established as baseline water quality prior to commencement of logging operation within Simbali (TA-4) forest area. The baseline data will assist the Developer is distinguishing between the impact that is related to the log harvesting operation and those that are contributed by the existing oil palm plantation on State land.

3.2.5 Associated Infrastructures

Associate infrastructures that are vital for the efficient operation of the proposed agro-forestry project will also be constructed. The Base Camp that will be established at Tol will consist of facilities such as workers accommodation, offices, workshop, fuel storage facility, generator set, log pond, etc. A sawmill will also be constructed at Tol.

Logging camps will be established at Ili, Tol and Kiep. These sites are also designated as logs/timber export sites and will have their own Wharf or Jetty.

3.3 OIL PALM PLANTATION

The third phase of the agro-forestry project will involve the establishment of oil palm plantations and village-oil-palm blocks that will provide a sustainable agriculture base for the resource area and Pomio District.

3.3.1 Proposal

The oil palm activity will commence during the Year 3 of operation. Initially, a nuclear oil palm estate and an oil palm nursery will be established at Mevlo valley during Year 3 and Year 4 of operation. The nursery will be used to support village-oil-palm blocks and other oil palm plantations that will be set up during Year 5 of operation.

Apart from the nuclear oil palm estate at Mevlo valley, village-oil-palm blocks and other oil palm plantations will be established at suitable locations within the project area, starting at 5 km to a distance of 10 km inland from the shoreline. Land areas at distances less than 5 km are not suitable for oil palm due to high salinity content of the soil. From the net area of 150,000 hectares, it is estimated that approximately 70-80 % of the project area can be planted with oil palm due to soil suitability. The actual percentage of land to be cultivated with oil palm will depend on the customary landowners consent under the lease lease-back arrangement.

The oil palm activity will commence with clear felling of selected logged-over sites within the project area in order to make way for oil palm plantation. Prior to commencement of clear-felling operation, the reserve areas (species protection, environmental constraints and buffer zones) will be marked and where clear-felling and vegetation clearance will be prohibited. This is an important planning phase prior to large-scale vegetation clearance and DEC would be consulted on this matter.

Certain infrastructures will also be constructed in order to support the oil palm operation. This includes construction of workers accommodation, offices, workshop, fuel storage facility, generator set and so forth.

Road Construction

Road networks are important for harvesting of fresh fruit bunches (FFB) throughout the year and it is necessary that an extensive grid of all-weathered road network be established.

Gravel for road construction will be extracted from nearby rivers after negotiation on gravel royalty payment is completed with relevant resource owners.

This road network will be initially established for the nuclear oil palm estate at Melvo valley. The same will be constructed at other plantation sites within the project area when they are established during Year 5 of operation and onwards.

Felling & Strip Lining
Local resource owners will be engaged to fell all remaining trees within the proposed nuclear estate site at Melvo valley with chainsaws and axes. After felling is completed, the area will be left for several months to facilitate natural decomposition of the felled vegetation.

Bulldozers will be used to push felled vegetation into rows of about 20 meters apart. This process is also called windrowing. This will enable two rows of palms to be planted at a distance of 10 meters apart.

Cover Crop
The leguminous cover crop comprising of *Calopogonium caeruleum* and *Pueraria javanica* will be shown between the windrows. The area will contain high organic matter content and fire will not be allowed in this area. Locations for planting of oil palm seedlings will also be marked.

Planting
Holes will be dug at marked locations and oil palm seedlings planted. Fertilizers will also be added to add nutrients to the soil and assist the young plants to establish roots and promote healthy growth. Fertilizer applications will depend on the soil structure and nutrient deficiency. Soil within the oil palm project area is classified as *mollic* and *humic andosols* due to their volcanic origin. Application of fertilizer will be carried out in accordance with Oil Palm Producers Association (OPRA) guidelines and in consideration of the environmental conditions.

3.3.2 Location Map

The map of the oil palm project area that will be obtained under the Timber Authority for Agriculture Clearance and the site of the proposed nuclear estate at Melvo valley is appended as Appendix 6.

3.3.3 Site Selection

The oil palm project area that will be leased under the Timber Authority for Agriculture Clearance was selected by the resource owners from Sinivit and East Pomio forest area. The decision was made because of the availability of sufficient forest resource volume and the good soil fertility in order to support an economically viable agro-forestry project.

Oil palm will be planted at selected locations within the project area, starting at 5 km to a distance of 10 km inland from the shoreline. This is due to soil suitability and other physical constraints (e.g. mountainous terrain at distances greater than 10 km).

3.3.4 Nearby Development Activities

As described in Section 3.2.4, the existing oil palm plantation under State land at Melvo valley may become the main source for contributing additive effect on background pollution level within the project area. The risks are associated potential for chemical pollution of Mevelo River from pesticide and fertilizer runoff from the plantation. In addition, elevated sediment load may also be discharged into Melevo River as a result of storm runoff from the plantation. These risks will contribute to increase pollution levels within Mevelo River. These existing water quality impacts may be aggravated during the establishment of an oil palm plantation at Simbali (TA-4).

The existing pollution levels within Mevelo River will be established as baseline water quality prior to the setting up of the nuclear oil palm estate at Melvo valley during the Year 3 of operation. The baseline data is important in differentiating between the impact that is related to its nuclear oil palm estate and those that are contributed by the existing oil palm plantation on State land.

3.3.5 Associated Infrastructures

Other facilities will be constructed at a later stage to allow for onsite processing of fresh fruit bunches into palm oil. These infrastructures are described in Table 11, below.

Table 10 - Infrastructure for Oil Palm Plantation and Processing

Infrastructure	Locations
Accommodation Camps	Melvo valley
Nursery	Melvo valley
Palm Oil Processing Plant	Melvo valley
Export Site	Melvo valley

NOTE: Melvo valley is the present site of an existing oil palm estate. The land is under State lease and considered suitable for establishment of a nuclear estate due to existing infrastructure.

Oil Palm Mill

An oil palm processing plant is planned during Year 7 of operation. The Developer will advise DEC on this important component of the oil palm project and apply for necessary approvals prior to the construction phase of the oil palm mill.

4. Development Timetable

Project schedule for the Ili-Wawas Integrated Rural Development Project has been amended due to setbacks in obtaining relevant State approvals from DEC and PNG Forestry Authority. Widebay Investments Limited will submit applications for Timber Authorities for Large Scale Roadline and Agriculture Clearance as soon as an Environment Permit is issued.

The tentative timetable for the various phases of the development activity is tabulated below and will depend on DEC and PNG Forest Authority issuing the relevant permits on time.

Table 11 – Project Development Schedule

Description	2005											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1. Public Presentation of Proposal												
2. Project Negotiations												
3. PFMC Meeting												
4. Forest Board award Project												
5. EP issued												
6. TA issued												
7. Project Financing												
8. Road	2006											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
9. Logging	2006 - 2017											
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
▪ Base Camp												
▪ Wharf/Jetty												
▪ Sawmill												
▪ Plantation												
▪ Logging operation												
	2018 - 2026											
	2018	2019	2020	2021	2022	2023	2024	2025	2026			
10. Oil Palm	2006 - 2017											
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
▪ Nuclear Estate												
▪ Oil Palm Mill												
▪ VOPs and Oil Palm Plantations												
	2018 - 2026											
	2018	2019	2020	2021	2022	2023	2024	2025	2026			

NOTE: EP = Environment Permit, TA = Timber Authority, VOPs = Village Oil Palms, PFMC = Provincial Forest Management Committee.

5. Characteristics of the Receiving Environment

Chapter 5 outlines the existing physical, biological and social baseline data for the project area and Pomio District were collected during the impact assessment study of the project area as well as from consultations with National and Provincial Government Agencies.

5.1 AVAILABLE ENVIRONMENTAL STUDIES & INVESTIGATIONS

Baseline data on the physical environment, including the flora and fauna species within the Island of New Britain and particularly the project area were collected during the impact assessment study conducted from 28th August to 14th September 2005. Other relevant data were obtained from State Agencies including DEC, PNG Forest Authority, National Museum, National Statistical Office, Pomio Health Center, Pomio District Administration (Five Year District Development Plan: 2003-2007) and Tzen Niugini Limited & Wide Bay Investments Limited (Forest Development Proposal & TA Applications). PNG Forest Authority conducted a forest survey on the project area in 1989 and 1994 (survey documents) while Wide Bay Investments Limited also undertake a forest survey in 2004.

Additional data on the flora and fauna species within the project area will be collated during detail coup surveys. However, it is anticipated that the flora and fauna composition will not vary significantly from what is presented in this impact statement.

The socio-economic data from Sinivit LLG, East Pomio LLG and Pomio District were also collected during the surveys referred to above. The socio-economic data showed that Pomio District is generally deprived of infrastructures and has poor socio-economic status in terms of economic development activities and social services such as schools and health centers.

5.2 PHYSICAL ENVIRONMENT

Physical environment consist of the land, water and air and development activities such as the proposed agro-forestry project has the potential to impact on these components of the environment. Baseline data discussed below describes the existing physical environmental conditions prior to commencement of the Ili-Wawas Integrated Rural Development Project.

Baseline data for the physical environment were recorded through *in-situ* observations (e.g. water quality observations) while others (e.g. rainfall data) were obtained from State Agencies due to their existing recording stations. Other environmental conditions (e.g. noise and air quality) are described based on observation of the existing pollution level within the project area. These data sets can not be measured during the assessment study since specialized recording equipment are required.

5.2.1 Geomorphological, Topographical & Geological Characteristics

Geomorphology & Topography
The topography of the oil palm project area and the 135 km road alignment is characterized by a gradually undulating topography that runs at a north-westerly direction from the shoreline.

The project area is surrounded by hills inland from the coast and stretches from the top northern end of Ili (TA-1) down southwards towards Wawas village (TA-13). All the hills from Ili (TA-1) southwards towards Kermen (TA-6) averages between 100-700 meters above sea level (ASL).From Simbali (TA-4) to Wawas (TA-12), the altitude rises gradually from the coast. Further inland, the topography ranges from 40–1,800 ASL.

The topography from the coastline to the foot of the hills varies between 40–400 ASL and covers a distance of 2–4 km. This eventually forms part of the Nakanai Mountain Range on the Island of New Britain that runs in a south-westerly direction (see Topographical Profile in **Appendix 7**).

Other topographical features at the foothills of the mountain range are sinkholes, which appears randomly. In addition, most of the twelve (12) TAs have between 2-4 rivers and about 1-6 smaller creeks. These surface waters were the result of the mountain rang divide that transects the Island of New Britain.

Geology
Geologically, the project area is characterized under the Finnisterre–New Britain Volcanic Arc structural region. The soil is characterized as quaternary and composed of oligocene volcanic material and volcanolithic sediments.

The coastal fringes consist of recently uplifted coronous and mostly marine sediments because of the earthquakes commonly experience throughout the geological life of the Island of New Britain. The geology of the inland area consisted of uplifted parent rock materials of volcanic origin. The common rocks identified are limestone, volcanic sedimentary, mixed sedimentary and alluvial.

The soils are *mollic* and *humic andosols* derived from the various rock types and are overlaid by volcanic coarse and fine sedimentary. Soils are generally dark-brown to Redish-brown in colour, well drained and are highly fertile in terms of chemical fertility.

5.2.2 Natural or Induced Hazard

The island of New Britain is situated in the pacific volcanic arc ("ring of fire") and is subjected to volcanic activities due to some active volcanoes on the island (e.g. Mt. Uluwun and Mt. Pago in West New Britain and Mt. Tavurvur and Mt. Vuluan in East New Britain. Since the project area is located on the north-eastern side of the island of New Britain, it is relatively calm. However, there are annual events of tremors due to the underlying geology and plate tectonic activity.

The project area experiences a coastal climatic regime and wet season is dictated by the onset of trade winds, which brings about rainy periods. Rainfall is experience throughout the year but becomes more pronounce during the wet season. Consequently, flooding is experienced annually by people living in villages and hamlets at the mouth of the major rivers such as Mevelo, Ip and Watok Rivers.

However, these natural phenomena does not provide an environmental risk to the proposed agro-forestry project since the risks have been taken into account in planning of the 135km road alignment and the agro-forestry project infrastructures and facilities. During the operational phase, all necessary preventative measures will be instituted to ensure that all the operational standards in the PNG Logging Code of Practice is observed.

5.2.3 Climatic Regime

Rainfall data within the project area was sourced from recordings at Tokua Airport in Kokopo and extrapolated to give an estimated annual rainfall pattern for Pomio District and the project area.

The extrapolated data-set on climatic regime within Pomio District indicated that the project area experience a typical maritime climate based on the north-west and south-east monsoons. Average rainfall is about 3,000 millimeters per year. Temperatures are more or less consistent all-year-around and ranges from 24–31 degrees Celsius. Dry season occurs during June to November while wet season is experienced between the months of November to March, annually.

5.2.4 Air Quality & Meteorological Data

Data on air quality within the project area and Pomio District was difficult to measure during the field survey since specialized equipment is required. Description provided below is based on observation of the existing pollution level as noted during the impact assessment survey.

The air quality within the project area is relatively pristine since Pomio District does not have any heavy industry and only a few trucks are available within the District. This background air quality level within the project area will be protected through use of appropriate mitigation measures so that the pristine air quality can be used as a reference in assessing the air pollution impacts of the agro-forestry project overtime.

5.2.5 Seasonal Surface Water Quality & Hydrological Information

Data on water quality was not obtained during the survey due to lack of potable field water-quality meter. Water samples were not collected due to the length of stay in the field (3-weeks), which makes sample storage, transportation and analysis difficult.

In general, water quality features of major rivers such as Mevelo, Ip and Watok Rivers are characterize by high turbidity and low clarity while smaller streams have low turbidity with good clarity. However, it is acknowledged that water quality data is important for assessing the impacts of the agro-forestry project overtime.

Hydrological data for the surface waters within the project area was also not collected during the impact assessment survey. It is understood from DEC that hydrological data on main river systems within the project area are also not available in the Department due to no hydrological recording stations.

However, the Proponent knows the importance of these information and will obtain the hydrological data plus the water quality data on all major rivers and streams within the project area for submission to DEC prior to the commencement of the agro-forestry project.

5.2.6 Seasonal Ground Water Quality & Flow Regime

As discussed in Section 5.2.5, data on ground water quality and flow regime was not obtained during the survey due to lack of appropriate field equipment. Water samples were not collected due to the time spent in the field and its implication in terms of sample storage, transportation and analysis.

Photo 3.	Pristine quality of small creeks within project area.

In general, ground water quality within the project area and Pomio District is expected to be in its pristine state since this resource is presently not utilized. This assumption is confirmed by the clear natural springs that are witnessed within the project area. It is also acknowledged that hydrological information on the ground water resource is essential for DEC to assess if there is any impact on the resource due to the operations of the agro-forestry project.

Therefore, the Proponent again makes a commitment to obtain the hydrological information on ground water quality and flow regime at sites where Base Camps (possible use of ground water) will be established for submission to DEC prior to the commencement of the agro-forestry project.

5.2.7 Noise Levels

Background noise levels within the project area and Pomio District was difficult to measure during the field survey since specialized equipment is required. The existing noise level observed during the impact assessment survey is described below.

Noise levels within the project area are very low and are characterized by human voices and avifauna noises near villages. Further inland, the noise levels are dominated by sounds generated by avifauna, which reflects the pristine quality of the environment.

On the other hand, occasional vehicle noises are generated in Pomio town due to the presence of a few vehicles. The noise level produced is low and does not appear to be of concern to local residents.

5.3 BIOLOGICAL ENVIRONMENT

Baseline data for the flora and fauna species within the Island of New Britain and those that occur within the project area are discussed below. Information on the availability of protected areas, special purpose area and the species characteristics is also provided.

5.3.1 Protected Area

Information obtained from Wildlife Branch of DEC indicated that there are no protected areas (e.g. Wildlife Management Area) currently present or planned to be established within the project area. The advice also revealed that there are no protected area(s) located within the vicinity of the project area, which may be affected when the agro-forestry project commences operation.

In addition, the fauna species (**Appendix 8**) registered during the impact assessment survey are commonly found on that Island of New Britain and Mainland New Guinea due to similarity in vegetation and climatic condition across. Although, additional assessment of the avifauna will be conducted during surveys on coups and set-ups, it is anticipated that the species cataloged will be those that are commonly available and will not be categorized as endangered or protected.

5.3.2 Special Purpose Areas

Areas such as a wetland as well as cultural, archaeological and historical sites can be classified as a "special purpose area" due to the values they sustain. Presence of cultural, archaeological and historical sites within the project area was also verified during the impact assessment survey through interviews conducted with resource owners, officials from Pomio District and East New Britain Provincial Administration as well as staff from the National Museum in Port Moresby.

Wetland

Certain areas at the lower reaches of the main rivers (e.g. Mevelo, Ip and Watok Rivers) experience seasonal inundation. World War II bomb craters which have been filled with water and served as ponds have also been spotted and will be protected These areas have been classified as inoperable areas and will be restricted from logging. Buffer zones specified in the PNG Logging Code of Practice will be established and the area demarcated as a reserve.

Cultural Sites

Preliminary discussion with resource owners indicated that a few cultural sites (caves, spring, old burial sites, old village sites, etc.) are located within the project area. These sites will be confirmed with clan elders during the survey of coups and set-ups and the sites demarcated with establishment of adequate buffer distance and protected from logging.

Archaeological & Historical Sites

National Museum does not have a formal record of war relics or archaeological features in the area designated for road alignment and the oil palm project area. In addition, the resource owners were only able to provide information on cultural sites within the project area but stated that they are not aware of any archaeological sites.

Photo 4.	Old Japanese war cemetery.

However, it is noted that the Island of New Britain was one of the sites of fierce fighting during the Pacific phase of World War II and war relics are likely to be discovered during construction and operational phases of the road network, logging operation and the oil palm development. Therefore, all effort will be made to ensure that any discovery is reported to the National Museum for preservation as a significant part of PNG's history.

5.3.3 Aquatic & Terrestrial Ecology

Island of New Britain has a rich bio-diversity, with fauna species that are endemic to that region. Recorded data from DEC indicated that about 15 species (12 birds and 3 mammals) are categorized as rare or threatened. With increasing logging and oil palm activities on the

lower altitude, much of the habitats have been destroyed and displaced fauna species may have found refuge in the high altitudes including the Whiteman Range due to environmental constraints that prevents logging and agriculture conversion of forested areas.

The description of the fauna species recorded within the project area is provided in Appendix 8 while those that are recorded as present on the Island of New Britain are listed in **Appendix 9**.

Aquatic fauna species that have been recorded in the project area are – freshwater eel (*anguilla spp.*), prawns (*macrobrachium spp.*), and freshwater fishes including catfish, black bass and others.

Flora species including – *Terminilia, Artocarpus, Barringtonia spp., Canarium indicum, Ficus spp., Inocarpus fagifer* and *Mangifera minor* which are fruit and nut bearing plants collected by the resource owners for food.

A detail list of aquatic and terrestrial flora species within the project area will be provided to DEC prior to the start of logging operation. This information will be collected after a flora survey of the project area, complemented with literature research. Data that will be presented to DEC will also highlight the traditional (see Section 5.3.5) and biological significance of the flora specie, where this is identified.

5.3.4 Vulnerable & Endangered Species

Comparative analysis of flora and fauna data in Section 5.3.3 obtained during the impact assessment survey and those recorded through past expedition indicated that the species found within the project area are categorized as commonly available species that are found on the Island of New Britain and Mainland New Guinea.

However, the Species Branch of DEC has advised that certain endemic fauna species may occur within the project area but not documented. The habitat of these endemic fauna species will be affected during selective logging operation prior to clear felling of selected sites for oil palm plantations. However, it is predicted that the affected fauna species will move to other forested or log-over areas including reserves and adapt to the new ecosystem proficiently due to similar vegetation and climactic conditions. It is also possible that the fauna species may recolonized the log-over areas at later years when log harvesting ceases.

5.3.5 Other Relevant Biological Information

The various traditional and cultural uses of the flora and fauna species within the project area were also documented. The list is not exhaustive but a representation of the wide range of uses of forest resource by the resource owners. The information tabulated below as well as others will be confirmed with clan elders during the detail coups and set-ups survey and protected from logging.

Table 12 – Traditional Uses of Flora & Fauna Species

Description	Traditional Use
Flora	
Bamboo	Food (bamboo shoots), building material, bow & arrow
Breadfruit	Food (fruit)
Pandanus	Food (fruit), mat weaving
Galip	Food (nuts)
Okari	Food (nuts)
Tulip	Food (leaves)
Bamboo	Food (bamboo shoots), building material, bow & arrow
Coconut	Food (nut), building material, basket weaving, etc.
Barringtonia(Pau)	Food (nuts)
Beetlenut	Food, (nuts), building material
Laulau	Food (fruits)
Talis	Food (nuts), building material
Mango	Food (fruits), building material
Aila	Food (fruits), building material, medicinal use
Fauna	
Wild Pig	Food, tusk is used for decoration
Cuscus	Food, fur used for decoration
Bandicoot	Food
Wallaby	Food
Cassowary	Food, feathers is used for decoration and in artifacts
Pigeon	Food, feathers is used for decoration
Wild flowl	Food
Parrot	Food, feathers is used for decoration
Cockatoo	Food, feathers is used for decoration & dancing (sing sing)
Hornbill	Food, feathers is used for decoration & dancing (sing sing)
Flying Fox	Food, fur is used for decoration
Snake Python)	Food, dancing & other rituals, etc

5.4 SOCIAL ENVIRONMENT

The existing social structure and socio-economic data on the resource owners, Sinivit and East Pomio LLGs, Pomio District and East New Britain Province is discussed in this section. Attempt is made to distinguish between the varying degree of environmental impacts and the resulting changes to the social, cultural and economic lifestyle.

These baseline information are essential for the present and the future planning and decision-making processes.

Socio-economic data within Sinivit to East Pomio LLGs indicated that the Wide Bay area has the only remaining strand of merchantable forest within the two LLG areas. Agricultural cultivation involving cocoa, copra and coffee has declined drastically due to the lack of a reliable transport infrastructure to transport the cash crops to the markets in Kokopo and Rabaul.

The current shipping service provided by MV Tawi is inadequate since it does not have the capacity to transport both the passengers and the cash crops to the markets in Kokopo. Consequently the existing small-holder plantations have been left idle and not attended to.

People within the project area including the resources owners currently resort to fishing and substances gardening for their own consumption.

With this lack of economic development within Pomio District and between the Sinivit to East Pomio LLG areas, social services in terms of health and education is barely in existence. This was highlighted in the PNG-AusAID Study on the least developed districts of PNG.

5.4.1 Demography

A number of villages are located within the project area from Ili village (Sinivit LLG) to Wawas villages (East Pomio LLG). The resource owners consist of four (4) main tribes (Baining, Mengen, Sulka and Tomoip) which represent twelve (12) landowner groups from Sinivit and East Pomio forest area.

Most of the villages are located on the coast. The customary land-ownership structure is based on the patrilineal system where the land and other processions are passed on to the eldest male offspring in the family.

The summary of villages and persons located within the project area are outlined in Table 13 and Table 14, below. The summary of villages and persons located within the project area are outlined in Table 13 and Table 14, below.

Photo 5.	One of many villages in project area.

The data was obtained from the impact assessment study and from information supplied by the National Statistical Office on the 2000 National (Population) Census.

Table 13 – Population Data of Sinivit and East Pomio LLGs

Local Level Government	Population
Sinivit LLG	10,400
East Pomio	5,033
TOTAL	**15,433**

Table 14 – Villages Situated within Project Area

Classification According to Timber Authority	Village
TA – 1: **Ili**	Ili
TA – 2: **Karong**	Karong
TA – 3: **Marunga**	Marunga
TA – 4: **Simbali**	Kavudemki
TA – 5: **State Land**	Nil
TA – 6: **Kermen**	Lamarein
	Long
TA – 7: **Lote-Kamlang**	Kaukum
	Hoiya
	Kalip
TA – 8: **Lakae**	Mu
	Milim
TA – 9: **Kiwaigu**	Klampun
	Guma
	Kilalum
	Iwai
TA – 10: **Kokakim**	Setwei
TA – 11: **Tesata**	Teimtop
	Sampun
	Tagul
TA – 12: **Kaluan**	Wawas

5.4.2 Existing Infrastructure

The existing infrastructure in the project area between Sinivit to East Pomio LLG areas is fairly poor due to low maintenance over the years. The existing 200 km all-weather road from Ili village to Wawas village in the south is in a rundown condition in certain sections.

Other villages that are not served by the existing road commute between villages using bush tracks. The bridges are also in a poor condition due to eroded bridge bankment. The current status of these infrastructures is discussed.

Table 15 – Existing Infrastructures within Project Area

Description of Project Area	Infrastructure				Remarks
	Road	Bridge	Wharf	Airstrip	
TA – 1: **Ili**	12.7 km	nil	nil	nil	Upgrading required
TA – 2: **Karong**	nil	nil	nil	nil	New Road
TA – 3: **Marunga**	12.0 km	nil	nil	nil	Upgrading required
TA – 4: **Simbali**	13.3 km	nil	1	1	Upgrading required
TA – 5: **State Land**	2.1 km	nil	nil	nil	Upgrading required
TA – 6: **Kermen**	29.8 km	nil	1	nil	Upgrading required
TA – 7: **Lote-Kamlang**	9.7 km	nil	nil	nil	Upgrading required
TA – 8: **Lakae**	9.7 km	nil	nil	nil	Upgrading required
TA – 9: **Kiwaigu**	7.6 km	nil	nil	nil	Upgrading required
TA – 10: **Kokakim**	4.4 km	nil	nil	nil	Upgrading required
TA – 11: **Tesata**	5.7 km	nil	nil	nil	Upgrading required
TA – 12: **Kaluan**	10.7 km	nil	nil	nil	Upgrading required
TOTAL	**117.7km**				

5.4.3 Public Health

The health status of the resource owners is generally good due to the physical workout they are subjected to each day as subsistence farmers. However, as in most rural communities in PNG, proper nutrition is sometimes lacking due to lack of a balance diet. Personal and community hygiene is also a concern is some villages.

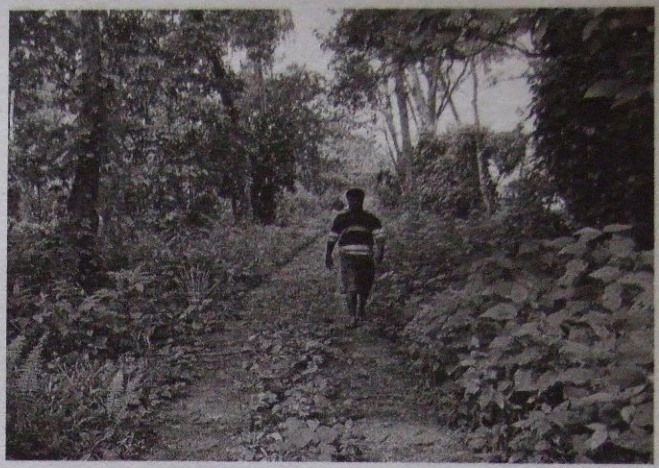


Photo 6.	Section of the 135 km road in rundown condition.

As a result of nutrition and hygiene, a number of preventable diseases such as malnutrition, water-borne diseases, diarrhoea, scabies and malaria are prevalent amongst villages within the project area. The data on the common diseases within the project area for 2004 as recorded by Pomio Health Center is provided in the Table below.

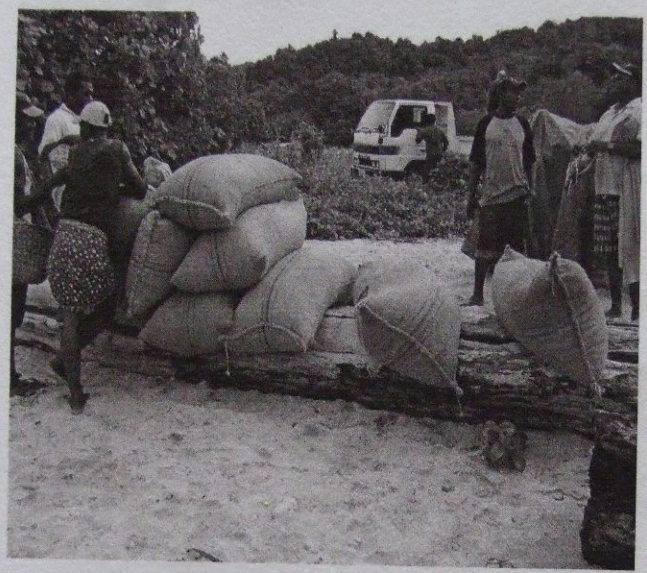
Table 16 – Health Status of Residents within Project Area

Classification of Disease	Statistics on Persons Treated
1. Anaemia	76
2. Cough	186
3. Diarrhoea	725
4. Eye Sore	214
5. Ear Sore	126
6. Malaria	5,642
7. Severe Malaria	178
8. Malnutrition	12
9. Measles	155
10. Meningitis	-
11. Pregnancy Issues (Birth-related)	-
12. Respiratory Disease	827
13. Skin Disease	2,103
14. Tuberculosis	-
15. Work Injury	278
16. Yaw	649
17. Pneumonia	858
18. Genital Discharges	9
19. Genital Ulcers	18
20. New Cases	1,484

NOTE: Statistics on persons treated at Pomio Health Center includes children and infants.

5.4.4 Economic Status

The economic scenario within the Wide Bay area indicated that agricultural activities involving cocoa, copra and coffee in on the decline due to the lack of a reliable transport infrastructure to transport the cash crops to the markets in Kokopo and Rabaul. MV Tawi, which provided shipping service between Pomio and Kokopo, does not have adequate capacity to transport both the passengers and the cash crops to the markets in Kokopo. As a result, small holder plantations have been left idle and not attended to.



The resource owners are mainly subsistence farmers and resort to fishing, hunting and substances gardening for their own consumption. Most of these activities take place in the coast where most of the villages in the project area are located.

Small revenue is generated from sale of their subsistence produce at local markets. This scenario will drastically change when the road network is established to connect Pomio with Kokopo and Rabaul.

Photo 7.	Cocoa bags ready for shipment

Small revenue is generated from sale of their subsistence produce at local markets. This scenario will drastically change when the road network is established to connect Pomio with Kokopo and Rabaul.

5.4.5 Social Services

Social services in terms of health and education are not accessible to most villages within the project area. The health centers and primary schools are located far away and inaccessible to most of the villages within the project area. Inadequate road network makes it difficult for villagers to travel to school or seek medical services when sick.

Photo 8.	One of the primary school within the project area.

Current data on schools and health centers within the project area or those used by villagers within the project area are described in Table 17 below.

Table 17 – Data on Existing Social Services within Project Area

Description	Name	Location
Schools (Primary)	Nongya Primary School	Ili TA
	Karong Primary School	Karong TA
	Marunga Primary School	Marunga TA
	Kavudemki Primary School	Simbali TA
	Spango Primary School	Kermen TA
	Kaukum Primary School	Lote-Kamlang TA
	Milim Primary School	Lakae TA
	Iwai Primary School	Kiwaigu TA
	Guma Primary School	Kiwaigu TA
	Sampun Primary School	Tesata TA
Schools (Technical)	Karlai Vocational Centre	Kermen TA
Health Centre	Marunga Health Centre	Marunga TA
	Hoiya Health Centre	Lote-Kamlang TA
	Guma Health Centre	Kiwaigu TA
Aid Posts	Ili Aid Post	Ili TA
	Karong Aid Post	Karong TA
	Spango Aid Post	Kermen TA
	Milim Aid Post	Lakae TA
	Iwai Aid Post	Kiwaigu TA
	Sampun Aid Post	Tesata TA

5.4.6 Archaeology, History, Culture & Religion

The local people within the project area are mostly affiliated with the Roman Catholic religion. Although, christianity is the key religious belief in the area, local people still practice their cultural and traditional beliefs.

Marriages, childbirth (first born) and other events are celebrated with feasting and traditional dancing. "Haus krai" is held during death of a person and a feast is conducted some months after the burial to thank those who participated during the mourning period and to farewell the decease.

6. Potential Impacts of Proposal

The potential impacts of the proposal are discussed in this Chapter. The discussion covers the physical, biological and social impacts of the proposed agro-forestry project.

6.1 PHYSICAL IMPACTS

Physical impacts occur due to discharges into the environment and the impacts this will cause to the baseline environmental conditions. The description of the potential physical impacts on the land, water and air as a result of the proposed agro-forestry project is described below.

The management regime for each of the identified physical impacts is outlined in Chapter 8 (Section 8.5).

6.1.1 Worst Case Scenarios & Potential Risks

6.1.1.1 Air Emission

Air emission in the form of dust will occur during the dry season during construction of the 135 km road network, construction of base camps, logging roads as well as during logging operation. Dust will also be generated during the dry season when oil palm plantation site is cleared for planting and during construction of plantation roads.

Dust generated will be localized and will not be a concern when works connected within the logging and oil palm activities are carried out. However, dust may become an issue in areas where road works passes by villages.

Exhaust emission will be produced from machinery used in the construction works connected with the agro-forestry activity. Air emission will also be generated from Base Camps from burning of combustible materials and from the sawmill activity.

The localized air emissions will all be managed using appropriated management strategies. In addition, the emissions will be easily dispersed due to the pristine air quality within the project area.

6.1.1.2 Wastewater Discharge

Domestic wastewater in the form of sewage and kitchen wastewater will be generated during construction of the road network and from the Base Camps. Wastewater produced during the road construction will be minimal and easily disposed off through temporary bush toilets (long-drop). Quantity of domestic wastewater generated from the Base Camps will be substantial and therefore requires adequate treatment before disposal.

Rainfall runoff from exposed areas will transport high sediment load into surface waters. Discharge of sediment in rainfall runoff will cause water quality degradation in surface waters. The flow of surface waters may also be altered as a result of deposition of sediment in stream-beds.

Excess water runoff may also occur in the oil palm plantation after irrigation and during rainfall events. The rainfall runoff may contain sediments, fertilizer and pesticides. Safe practices for application of pesticides and fertilizers will be complied with in order to reduce the risk of surface water pollution due to chemical runoff.

6.1.1.3 Solid Waste

Small quantities of industrial and domestic solid wastes will be produced during construction of the 135 km road and during establishment of oil palm plantations. Most of the domestic solid wastes generated during the logging operation will be at the Base Camp.

Domestic solid wastes will include empty tin cans, cardboard boxes, plastic wrappers, etc. Wastes will be produced from kitchen during meal preparation and from office operations. These wastes do not pose a risk to the environment and can be easily managed. Environmental risks associated with domestic wastes are not significant if adequately managed. This is because domestic solid wastes are inert or biodegradable in nature.

Industrial solid wastes generated will also be small and produced from minor mechanical repair (change oil filter, battery, etc.) that may be carried out in the field and from the workshop activity at the Base Camps. . Empty pesticide and fertilizer containers will also be produced from the oil palm activity.

6.1.1.4 Noise Emission

Level of noise generated during construction of the 135 km road will be high near villagers as a result of the use of heavy machinery. Noise will be high during the land preparation for oil palm plantation. The logging activity will also produced high level of noise due to the use of heavy machinery in loading and unloading of logs.

Generator sets and sawmill activity at the Base Camps will also generate a lot of noise. However, the level of noise generated will be minimal and localized since the noise emissions will only occur during the day. Noise buffer systems may also be constructed to reduce the noise impact from generator sets and sawmill activity.

6.1.1.5 Water Extraction

Water requirement for domestic use (apart from drinking) during the construction of the 135 km road and for oil palm irrigation will be sourced from nearby streams. Water for domestic use at Base Camps will also be extracted from surface waters or groundwater to supplement water collected from rain-catchment tanks.

Water extraction rate will be determined based on hydrological data from the water source in order to ensure that there is sufficient water flow after water is extracted.

6.2 BIOLOGICAL IMPACTS

Biological impacts will occur as a result of construction of the road network through forested areas (in certain areas), selective logging operation and the clear-felling of selected oil palm sites for oil palm plantation.

The impacts will occur on both the flora and fauna species within the project area.

6.2.1 Worst Case Scenarios & Potential Risks

6.2.1.1 Fauna

Fauna species within the project area will be affected as a result of the agro-forestry project. Construction of the 135 km road network, selective logging operation and clear-felling of selected sites within the project area for oil palm plantation will affect the variety of fauna species found in the project area.

The most affected would be birds and mammals species due to the destruction of their habitat. Affected fauna species will migrate to reserves (wetland, buffer zones, cultural sites, etc) established within the project area. It is also possible that fauna species affected by the agro-forestry activity will migrate to forested areas outside of the project boundary and possibly return to recolonise the project area after the logging operation ceases. Those species would easily adapt to their new habitat due to the fact that the climate and vegetation type will be similar to their old habitat.

The significant impact on the fauna species will occur during clear-felling operation for establishing oil palm plantations. The operation will involve compete destruction of habitats and which will affect fauna species within sites earmarked for oil palm plantations.

However, it is anticipated that during the selective logging operation, most of the fauna species would have already migrated to new habitats (reserves within project area or sites outside project area) and the impact would not be that drastic. A wildlife corridor may be established within the oil palm plantation (if necessary) to provide for movement of fauna species from the inland mountain range to the coast.

On the whole, there will not be any significant impact on the fauna species within the project area since comparative analysis of fauna data within the project area (Chapter 5, Section 5.3) showed that there are no threaten or endangered species available. All the species recorded are commonly available on the Island of New Britain and Mainland New Guinea.

6.2.1.2 Flora

Flora species will be more severely affected than the fauna species due to the development activity.

During construction of the 135 km road infrastructure, all vegetation within the road corridor will be removed. Although this is necessary for establishment of the infrastructure,

the cost will be the complete destruction of flora species within the road corridor. However, the road footprint will be small and will not affect the diversity of flora species since the same is found elsewhere in the project area.

Logging operation will also result in destruction of flora where logging roads are constructed and during tree felling where residuals and other smaller trees, vines, etc. will be destroyed. In terms of species diversity, the selective logging operations will not adversely affect the flora species since the same species are available on the Island of New Britain and Mainland New Guinea due to similar climatic system and soil structure.

The most significant destruction of flora will occur during clear-felling of logged-over areas for establishing oil palm plantations. Although a mono-crop will replace a diversity of flora, the similar vegetation types are also available elsewhere on the Island of New Britain and Mainland New Guinea.

6.3 SOCIAL IMPACTS

6.3.1 Group (A) Impacts: Worst Case Scenarios & Potential Risks

Group (A) Impacts are the social impacts that can be identified and addressed by the DEC approval process. These impacts occur as a direct result of adverse bio-physical environmental impacts on the environment due to the development activity and which can be regulated by the Department. (SOURCE: Guideline for Conduct of Environment Impact Assessment and Preparation of Environment Impact Statement)

6.3.1.1 Degradation in Air Quality

Although air emission from activities associated with the agro-forestry activity will occur, it is anticipated that the environment measures that the Developer will implement will adequately manage and reduce any air pollution concern on human health. Consequently, the social impact of air pollution within the project area will be negligible.

Issue

Air emission in the form of dust will occur during the dry season while road works on the 135 km road is in progress. Dust may become a concern when the road works approach villages. Other sources of dust include logging operation, where dust will be generated during construction of base camps, logging roads and during logging operation. Dust will also be generated when clearing vegetation for establishing oil palm plantation and construction of plantation access roads.

Exhaust emission will be produced from machinery that are used in the road construction and land preparation of oil palm plantation. Machinery, generator set and vehicles used during the logging operation are also sources of exhaust emissions. Burning of combustible materials at the Base Camp will also contribute towards air quality degradation in the project area

6.3.1.2 Degradation in Water Quality

Degradation in water quality will inevitably occur as a result of the agro-forestry project. Although buffer zones will be established along watercourses to reduce the impact of sediment in rainfall runoff, the impact on water quality will still occur. The Developer has committed to providing water supply to villages within the project as a contribution towards improving the health status of the resource owners. Villagers that will be directly affected will be given priority to ensure that they are provided with an alternative drinking water source.

Issue

Domestic wastewater (sewage and kitchen wastewater) in minimal quantity will be generated during construction of the 135 km road from Cape Orford TRP (south-west) to Kokopo Ili (east). However, a substantial quantity of domestic wastewater will be produced from the Base Camp due to the number of employees there.

Rainfall runoff from the exposed areas during road construction, logging operation and vegetation clearance for oil palm plantation will result in large quantity of sediment (dissolve and suspended solids) being discharged into surface waters. Sediment load in runoff has the potential to cause degradation in surface water quality and alter the flow regime of surface waters as a result of deposition of sediment in stream-beds. Excess water runoff from oil palm plantation after irrigation and during rainfall events may also introduced fertilizer and pesticides into surface waters.

6.3.1.3 Increased Noise Levels

Noise emission will occur during the construction and operational phases of the agro-forestry project. However, the management measures that the Developer will put in place will reduce concern on noise levels during the development phases. As a result, the social impact of noise within the project area is expected to be negligible.

Issue

The level of noise generated during construction of the road will not pose a concern except near villages where the level of noise may become a concern. During logging operation, noise levels will be high as a result of use of heavy machinery that will be used in loading and unloading of logs. Generator sets and machinery workshop will also produce a lot of noise. Noise will also be produced from heavy machinery during land preparation for oil palm plantations.

6.3.1.4 Land Contamination

Land or soil contamination will occur during the development of the Ili-Wawas Integrated Rural Development Project due to either chemical pollution (e.g. fuel spillage, waste oil, etc) or waste disposal (landfill sites). However, it is anticipated that land contamination will not cause any significant concern since the risk of chemical pollution from oil or fuel spillage will be minimized through compliance with the Environmental Code of Practice for Vehicle/Machinery Workshop and Fuel Storage Site.

On the other hand, landfills will be constructed in accordance with the Environmental Code of Practice for Sanitary Landfill Sites. Therefore, the risk of social impact arising from land contamination within the project area will be minimal.

Issue

Small quantities of industrial and domestic solid wastes will be produced during construction of the 135 km road. Domestic solid wastes will include empty tin cans, cardboard boxes, plastic wrappers, etc while industrial solid wastes generated will be form minor mechanical repair (change oil filter, battery, etc.) that may be carried out in the field.

Most of the domestic solid wastes generated will be at the Base Camp. Wastes will be produced from kitchen during meal preparation and office operations. Environmental risks associated with domestic wastes are not significant if adequately managed. This is because domestic solid wastes are inert or biodegradable in nature. Small quantity of industrial solid wastes will also be produced. The main source of the industrial solid wastes will be the workshop activity (servicing, change oil filter, battery, etc.).

Small quantity of domestic and industrial solid wastes will also be produced during establishment of oil palm plantations. Wastes generated will include empty tin cans, boxes, plastic wrappers, etc. Empty pesticide and fertilizer containers will also be produced.

6.3.1.5 Loss of Food Sources

Villagers within the project area rely on their forest resources as a significant source of food apart from fishing and subsistence gardening. Commencement of selective logging will affect the availability of these forest resources.

There will not be significant loses in terms of vegetables or edible tree species such as Tulip, Kapiak, Laulau and Marita (Pandanus specie) since these sites will be protected from logging. The main impacts will arise from shortage of animals (pigs, bandicoots, etc.) because they will most likely migrate to other areas including the protected reserves located within the project area. There is also potential for fish catches within the project area to be affected, especially prawns and other edible aquatic species within small streams.

However, the loss of animals and edible tree species will be pronounced within areas that are selected for oil palm plantation. These plantation areas will be clear-felled prior to the establishment of oil palm plantations.

6.3.1.6 Habitat Loss

The risk of habitat loss due to selective logging will not be so significant. The impact will be temporary since displaced fauna will move into protected reserves within the project area and forested areas outside the project area and return after logging operation has ceased.

However, habitat loss will be dramatic within sites designated for oil palm plantation. Clear-felling will destroy habitats within these sites. However, the proposal by the Developer to establish "wildlife corridors' within oil palm plantations will ease the impacts of loss of habitats and allow of fauna species to migrate into reserves or other forested area.

6.3.2 Group (B) Impacts: Worst Case Scenarios & Potential Risks

Group (B) Impacts are the secondary socio-economic effects that are expected to manifest themselves and are best handled by the responsible National, Provincial or Local Level Government agencies. Examples of these issues are - social structure, law and order, migration and population issues, inadequate infrastructure concerns, historical and cultural issues, etc. (SOURCE: Guideline for Conduct of Environment Impact Assessment and Preparation of Environment Impact Statement)

6.3.2.1 Social Structure

The community structure within the project area is based on customary groups which come together to form a tribe. The primary social unit is the clan, which comprised of immediate and extended family units. Patrilineal structure is practiced whereby the male head of the family takes charge of all decisions relating to the land and customary welfare of the family unit. Therefore, land and other material ownership is passed onto the male offspring who assumes ownership of the land and all the plants, fruit species, etc that are available on the family land.

The Developer will ensure that the agro-forestry operation does not in any way affect the social structure of the landowners within the project area.

6.3.2.2 Law and Order Issues

Immigration of people into the Sinivit and East Pomio LLG areas in search of job and business opportunities will result in the risk of possible law and order concerns due to cultural differences. Access to cash economy may also result in misuse of money through spending in unnecessarily items such as alcohol, which will give rise to alcohol-related issues. It is also possible that settlement of non-landowners in customary land will lead to dispute and possible classes between landowners of the resource area and outsiders.

Since the project is the initiative of the Member for Pomio Open with support from the Sinivit and East Pomio people and the LLG and Provincial Government Members, a Law and Order Plan will be formulate to manage such issue should it arise.

6.3.2.3 Migration and Population Issues

Immigration of people from outside the Sinivit and East Pomio LLG areas may occur, especially in search of job and business opportunities. The movement of outsiders into the project area will result in a drastic increase in population. This will impose unnecessary burden on the Sinivit and East Pomio LLGs and Pomio District in providing social services under existing budgetary constraints.

This scenario will be minimized or even averted due to the fact that most of the land within and adjacent to the project area are all customary owned and settlement of non-landowners on traditional land will not be tolerated.

6.3.2.4 Historical and Cultural Issues

Sites of historical and cultural values within the project area will be identified with the assistance of the landowners. These sites are held as scared by the resource owners and will be set-aside as cultural reserves. Buffer zones will be established and logging operation will not take place within these reserves.

Historical and cultural sites will also be an important factor in deciding the suitable location for establishing oil palm plantations in order to ensure that the activity does not encroached on the reserve. However, the same can not be guaranteed for historical and cultural sites located outside of the project area.

6.4 AMBIENT & EMISSION STANDARDS USED TO ASSESS PROJECT EFFECTS

The standards that were referenced during assessment of the potential environmental impacts of the proposed Ili-Wawas Integrate Rural Development Project are –

1. *Environment (Water Quality Criteria) Regulation 2002.*
   The national fresh water quality standards for PNG is provided in the Regulation. The standards was used to assess the potential impacts of storm runoff and sewage discharges on surface water quality during construction of the 135 km road, log harvesting operation and establishment and operation of the oil palm plantations.

2. *PNG Logging Code of Practice.*
   The environmental performance standards for log harvesting activity are described in the document. The performance standards were used to assess the potential risk associated with soil erosion and discharge of sediments into surface waters through rainfall runoff.

   The risk of water diversion and reduction of flow velocity due to deposition of forest debris and soil were also evaluated against the requirements in the logging code.

3. *Environmental Code of Practice on Sanitary Landfill Sites.*
   The environmental performance standards for operation of a sanitary landfill as well as solid waste collocation and disposal requirements are described in the document. The performance standards were used to assess the potential risk associated with landfill siting, ground water pollution, rainfall runoff, health risk, odour pollution, etc. due to landfill operation.

4. *Environmental Code of Practice on Vehicle & Machinery Workshop, Petroleum Storage, Sale, Usage Sites.*
   The environmental performance standards for operation of a workshop and the fuel storage sites are described in the document. The standards were used to assess the potential impacts of waste oil generated from the workshop and the fuel storage sites as well as potential risk for fuel spillage.

5. *Environmental Code of Practice on Oil Palm Processing.*
The environmental performance standards for the oil palm mill are described in this document. Those standards are not applicable to the agro-forestry immediately because the oil palm mill will be established at Year 7 of operation and about five years after the oil palm plantations have been fully developed with adequate supply of fresh fruit bunches for processing. Wide Bay Investments Limited will apply to DEC to amend the Environment Permit to include operation of the palm oil mill when the mill is ready to be constructed.

6. *Environmental Code of Practice for Roads & Bridges.*
The environmental performance standards construction of roads and bridges are described in the document. Although, the standards are designed for Department of Works to observe during the upgrading of national and provincial road and bridges, the environment management principles outlined in the document are applicable to other construction works on roads and bridges including the agro-forestry road infrastructure.

6.5 ASSESSMENT OF RESILIENCE OF THE ENVIRONMENT

The existing environment within the project area has been exposed to certain development activities in the past. For instance, TA-6 (Kermen) and TA-7 (Lote-Kamlang) has been subjected to some form of logging in those areas while a small percentage of TA-8 (Lakae), TA-9 (Kiwaigu), TA-10 (Kokakim), TA-11 (Tesata) and TA-12 (Kaluan) has been clear-felled by landowners and cultivated into cocoa, coconut or vanilla blocks.

Timber Areas	Developer	Year Logged
1. Kaluan	Niugini Lumber Co.	2002
2. Lote-Kamlang	Kerewara Ltd	2002
3. Simbali	Open Bay Timber Co.	2000
	Kerewara Ltd	2002
4. Simbali Extension	Open Bay Timber Co.	1990
5. Ili	Kerewara Ltd	Small Operation only 2003

Photo 9. Certain TAs have been logged in the past.

These activities did not really affect the ability of flora and fauna species to recolonise the logged over areas or being present within the vicinity of oil palm plantations. This is an indication that the impact of the proposed agro-forestry project will be harsh on flora and fauna species during the selective logging operation and establishment of oil palm plantations but they will recovered afterwards and recolonise the logged over sites.

7. Waste Minimization, Cleaner Production and Energy Balance

Chapter 7 discusses the waste minimization and cleaner production processes that may be adopted, where applicable, in avoiding the generation of wastes at the source through the use of innovative strategies. Where this is not possible, the relevant waste management strategy is formulated to manage the wastes in accordance with the waste minimization principle.

7.1 ALTERNATIVE "CLEANER PRODUCTION" TECHNOLOGIES OR PROCESSES

Alternative production processes and cleaner technologies are mentioned where they are applicable to the three different components of the agro-forestry project. The discussion explains the processes and technologies that are considered as appropriate in PNG context and are commonly used by similar activities within the country.

7.1.1 Road Construction

There is no alternative cleaner production process for construction of roads. The process that will be used is the standard road construction method that is used worldwide and in PNG in road construction. The key element of road construction is to ensure engineering integrity of the road infrastructure once completed.

Road construction process will involve the use of bulldozer, graders, rollers and other machinery. The planning and design of the 135 km road including bridges and culverts will be undertaken by professional Civil Engineers in accordance with the road design standards from the Department of Works (**Appendix 5**). Logging roads for selective logging within the oil palm project area will be constructed in accordance with the requirements in the PNG Logging Code of Practice.

During construction of the road and while logging operation is in progress, the road would be regarded as a logging road. Upon completion, a formal certification will be conducted by Department of Works in transferring and reclassifying the road as a national road for supervision and maintenance by the National Government.

7.1.2 Log Harvesting & Processing

There is no alternative cleaner production process for log harvesting in PNG. The log harvest procedures used in the country is in accordance with the prescribed standards in the PNG Logging Code of Practice. These logging practices are prescribed by the PNG Government and are observed by all forest industry participants who are involved in log harvesting in PNG.

The logging operation generally begins with a forest survey in order that coups, set-ups and buffer zone boundaries are demarcated. Log landing, snig track layout, tree classification and marking are performed. Logging roads are also constructed.

Once these initial preparations are completed, the log harvesting operation is conducted through selective felling of marked merchantable tree species. The branches on the felled trees are removed and transferred to log landings before being transported to the log pond.

At log pond, the logs are sorted and graded for export as round logs. Those that do not meet export market specifications are transported to the sawmill for processing into timber products for both export and domestic markets.

Logs earmarked for processing into wood-based products at the sawmill are debarked and cut according to required specifications. The logs are fed into different processing machinery in accordance with the buyer's orders.

Air filter bags and noise barriers will be installed within the sawmill plant (where buffer distance is not sufficient) depending on the environmental risks involved. However, it is anticipated that adequate buffer will ensure that noise emission does not become a health issue.

The sawmill processes described in Section 3.2.1 are commonly used in PNG and are also utilized by the Developer in three of its timber concessions in West New Britain Province. The same technologies are also employed in sawmills operated by the major operators in the logging sector in the country.

7.1.3 Oil Palm Plantation

There is no alternative cleaner production process for establishment of oil palm plantation since oil palm planting procedures are very basic and commonly used by oil palm industries in PNG. The oil palm planting process commences with felling of remaining trees within the proposed oil palm site using chainsaws and axes. After felling is completed, the area is left for several months to enable natural decomposition of the felled vegetation.

Bulldozers are then used to push felled vegetation into rows of about 20 meters apart. This process is also called windrowing as it enables two rows of palms to be planted at a distance of 10 meters apart. This is followed by sowing of leguminous cover crop between the windrows.

Holes are dug at marked locations and oil palm seedlings planted. Fertilizers are then added to add nutrients to that soil and assist the young plants to establish roots and promote healthy growth. Fertilizer applications will depend on the soil structure and nutrient content Application of fertilizer will be carried out in accordance with OPRA guidelines and in consideration of the environmental conditions in order to reduce excessive application and minimize chemical runoff.

7.2 BASIS FOR CHOOSING THE PROPOSED TECHNOLOGY OR PROCESS

Technologies or procedures that will be used in the construction of the 135km road network, log harvesting and processing and the establishment and up-keep of the oil palm plantations is due to the fact that these are commonly available technologies and processes applicable to PNG. These technologies and procedures are also currently used widely in the country. In addition, existing laws or standards (e.g. PNG Logging Code of Practice and Department of Works' standards for roads, bridges & culverts) indirectly dictate the technology that will be used.

7.3 AVAILABLE TECHNICAL BACKGROUND ON THE PROCESS CHOSEN

The Developer has the necessary expertise and skills in construction of roads, carrying out log harvesting and development of oil palm plantations as discussed below.

7.3.1 Road Construction

The Developer has the technical expertise and skills in construction of roads. Logging roads have been constructed at East, West and Central Arowe TRPs in West New Britain Province in accordance with the PNG Logging Code of Practice. These roads essentially comply with the Department of Works (DoW) standards for roads and bridges. Prior to commencement of construction work on the 135 km road, the DoW would be consulted to ensure that the road infrastructure is constructed in accordance with the required standards so that it can be easily converted into national road after the log harvesting operation ceases.

7.3.2 Logging Operation

The Developer also has a vast knowledge and experience in logging operation and has current operations at East, West and Central Arowe TRPs in West New Britain Province. These knowledge and skills would be utilized in ensuring that the salvage logging operation within the road corridor as well as selective logging within the oil palm project area is carried out in accordance with the PNG Logging Code of Practice and other environmental requirements impose by DEC.

7.3.3 Oil Palm Plantation

For development of oil palm plantations and village-oil-palm blocks, the Developer will engage rural extension officers from East New Britain to assist with establishment of the plantation and conduct rural outreach programs. Skilled oil palm plantation managers will be recruited from Malaysia to oversea the planning and development of the oil palm plantations on selected sites within the project area and the nuclear oil palm estate at Melvo valley.

7.4 WASTE MINIMIZATION STRATEGY

The aim of the waste minimization strategy is to avoid generating wastes at the source through the use of innovative strategies. Relevant waste minimization strategies that will be used during the three different phases of the agro-forestry project are discussed below.

7.4.1 Road Construction

The 135 km road infrastructure (including bridges and culverts) will be constructed using standard road construction methods and by observing the Department of Works specifications for roads and bridges as well as the standards for logging roads under the PNG Logging Code of Practice.

Waste minimization measures that will be implemented are -

(a) regular servicing of vehicles and machinery to minimize noise and exhaust air emission, and
(b) reduce the volume of domestic and industrial solid wastes by encouraging recycling and reuse of materials where possible.

7.4.2 Logging Operation

The logging operation will be conducted in accordance with the PNG Logging Code of Practice and other environmental requirements impose by DEC.

Waste minimization measures that will be implemented during this phase of the agro-forestry project are -

(a) regular servicing of vehicles and machinery to minimize noise and exhaust air emission,
(b) careful use of water for domestic purposes to reduce amount of wastewater generated and requiring treatment, and
(c) reduce domestic and industrial solid wastes by encouraging recycling and reuse of materials where possible.

7.4.3 Oil Palm Plantation

The establishment of oil palm plantations and their up-keep will be carried in accordance with Environment Permit conditions and by observing guidelines issued by OPRA. Safety and storage instructions for fertilizers and pesticides issued by the chemical manufacturer will also be observed

Waste minimization measures that will be applied during the establishment and operation of oil palm plantations are similar to those discussed above and includes -

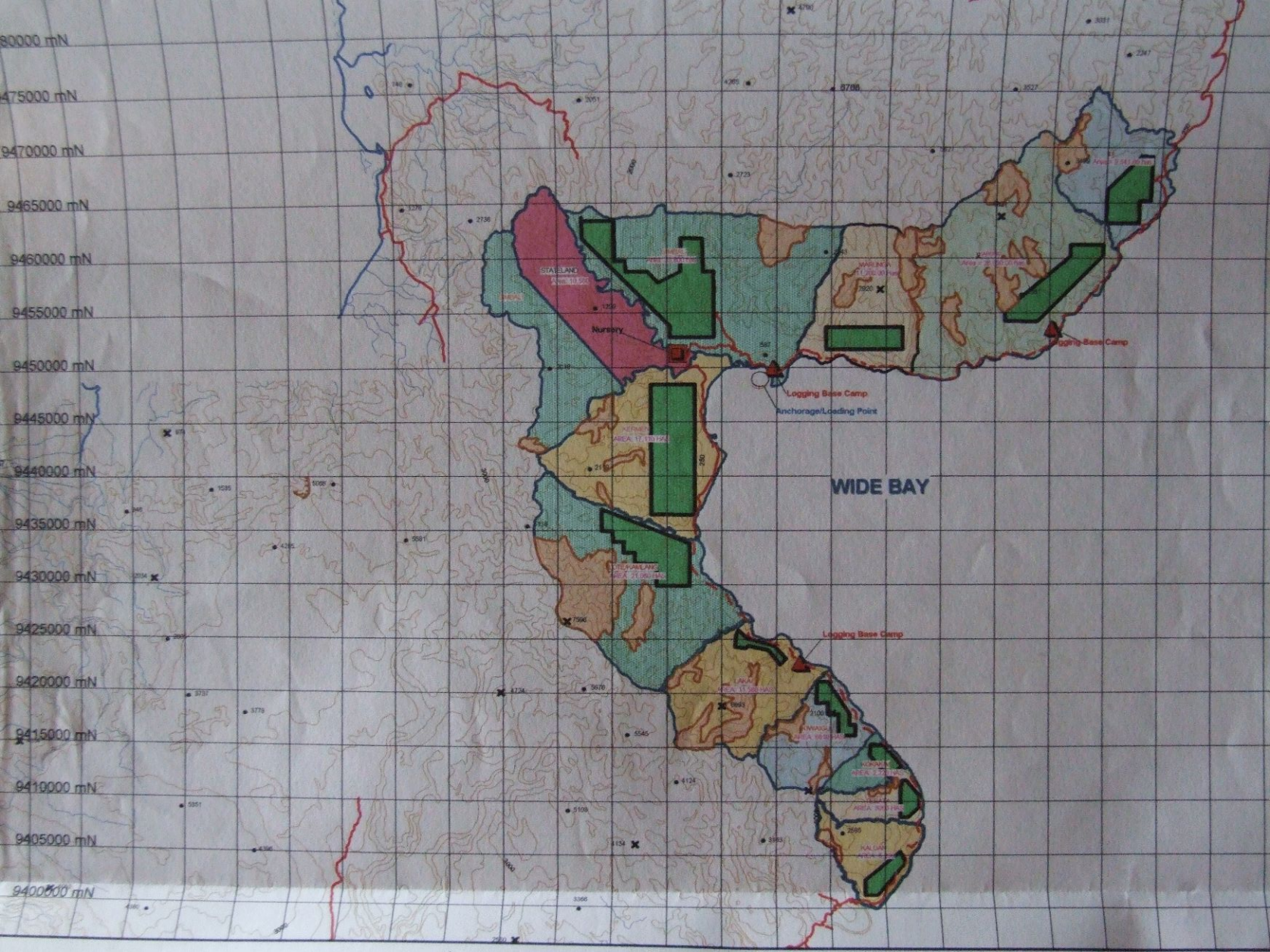
(a) regular servicing of vehicles and machinery to minimize noise and exhaust air emission,
(b) careful use of water during irrigation of young palms in order to reduce amount of wastewater generated as runoff,
(c) reduce domestic and industrial solid wastes by encouraging recycling and reuse of materials where possible, and
(d) ensure that right amount of pesticides and fertilizers are applied per hectare of oil palm.

7.5 ENERGY BALANCE

The energy balance concept for Road Construction, Logging Operation and establishment of Oil Palm Plantation are discussed together because the same principles will be applied to all the three different phases of the agro-project.

The primary energy source that will be used during the three different phases of the agro-project is hydrocarbon fuel oil. A substantial volume of fuel oil will be required by machinery (generator sets, sawmill machines, portable chainsaws, etc.) and vehicles (earth moving vehicles, trucks, jinkers, etc.) during the construction and operational phases of the project.

Off-cuts from the sawmill operations will also be reuse as a fuel source by employees and as boiler fuel.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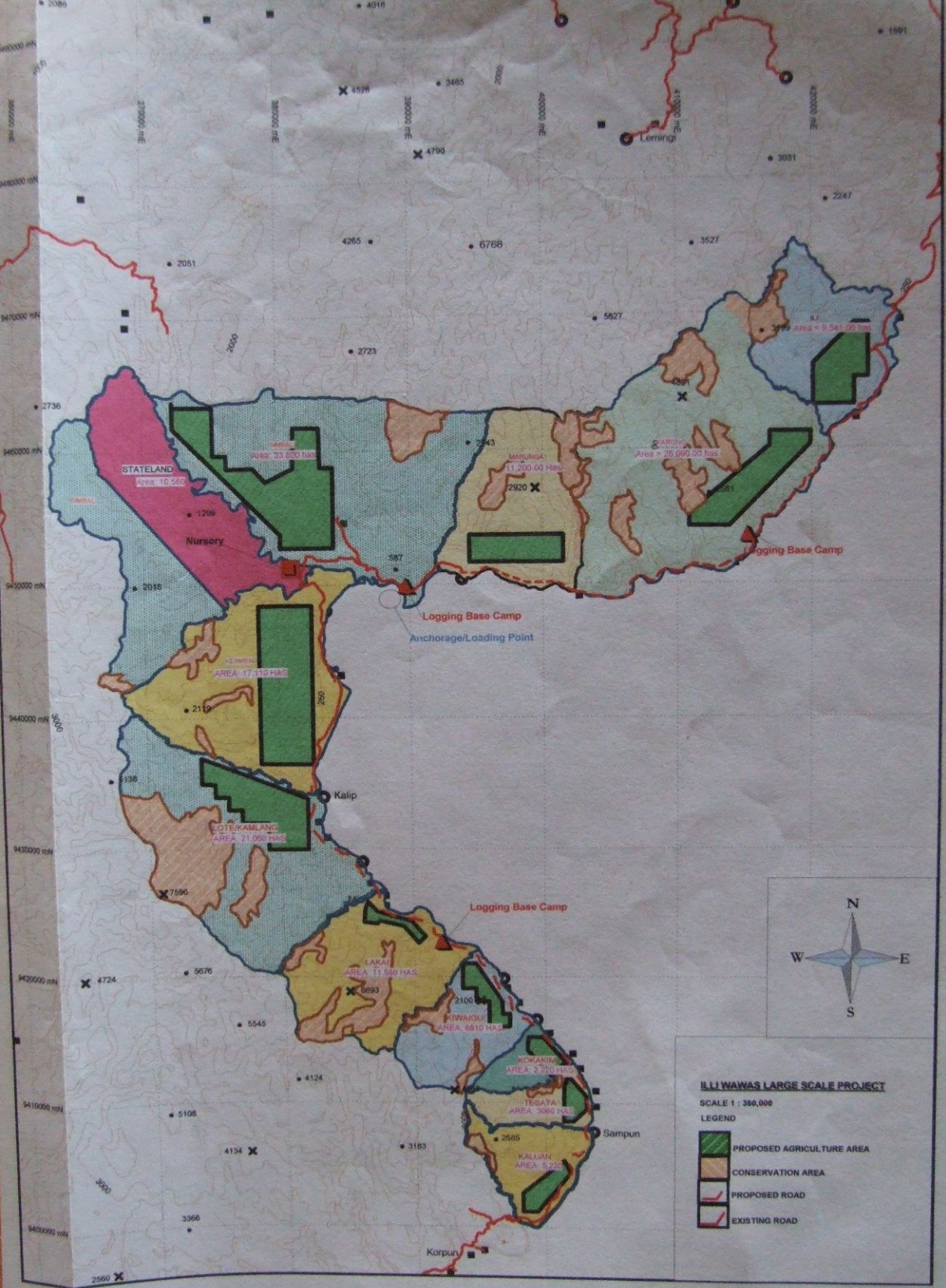
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